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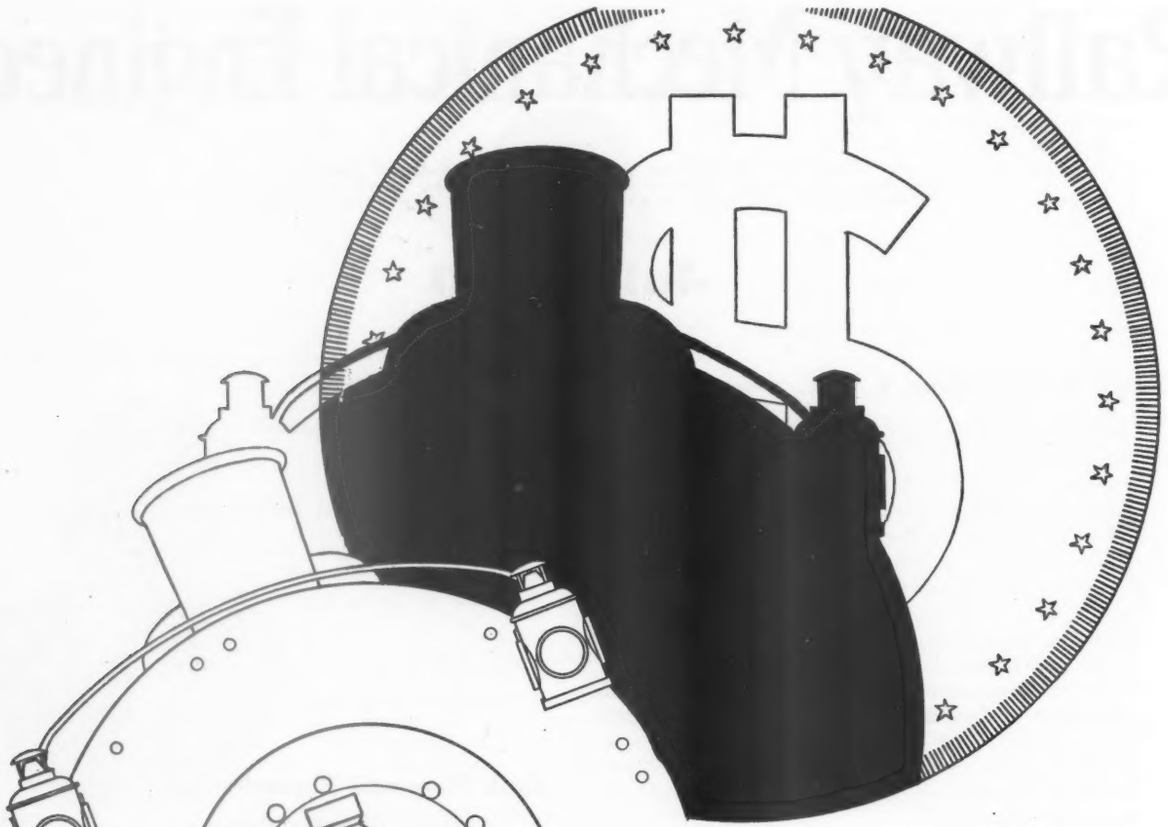

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July - 1933

Mechanical Division Standing Committees Present Reports

BECAUSE of the urgent need for economy, the annual meeting of the Mechanical Division, American Railway Association, usually held during the month of June, was dispensed with for 1933. In order that there might be no break in the continuity of the work of the association, however, the reports of the standing committees were presented before an open session of the General Committee of the Mechanical Division, at which the committee chairmen and a few other members were present. The recommendations of the various committees were acted upon by the General Committee and in most cases will be submitted to letter ballot where such action is required. Inasmuch as no annual meeting was held, no reports were presented by the General Committee itself or by the Nominating Committee and no election of officers was held.

The Committee on Safety Appliances at a meeting held June 26 decided to recommend to the General Committee the adoption of a report from the Committee on Brakes and Brake Equipment covering "Specifications for freight-train brake equipment" for submitting to letter ballot for adoption as a standard of the association for new equipment to become effective as soon as approved. This recommendation was approved by the General Committee, and the secretary instructed to issue the necessary letter ballot as promptly as possible.

H. B. Bowen, chief of motive power and rolling stock, Canadian Pacific, was elected to membership on the Committee on Locomotive Construction to fill the vacancy created by the death of C. E. Brooks.

The meeting was conducted by the chairman of the Mechanical Division, E. B. Hall, general superintendent motive power and machinery, Chicago & North Western. Fifteen reports, abstracts of which follow, were presented.

Report on Automatic Train Line Connectors

The investigation of automatic train line connectors has been continued in the laboratories of Purdue University during the past year. Reference is here made to the reports of the Director of Research at the annual meetings of the Mechanical Division for the years 1930 to 1932 inclusive which present the progress of the investigation up to June 1932.

The General Committee held an open session at Chicago on June 27 at which reports were presented by the committee chairmen and recommendations acted upon for submission to letter ballot

The plans and specifications of their devices have been submitted by fifty-one different companies or individuals who are manufacturers or patentees of some form of automatic train line connector. These specifications have been carefully studied and nine different devices have been ordered for the laboratory tests. These devices were selected as representative of the various types; such as coupler supported, car-body supported, wing type or pin-and-funnel type gathering devices, butt-face ports, 45 deg. ports or side ports.

Six freight and six passenger connectors of each of the nine different designs were ordered for laboratory tests. Up to the present time six of the nine designs of freight type connectors have been delivered and submitted to the laboratory tests, namely; Robinson wing type, Robinson ball-and-funnel type, American, Roberts, National and Johnson. The three types of freight connectors which have been ordered but not delivered are Workman-Robinson, Cobb and MacTaggart.

Three of the nine designs of passenger connectors have been delivered and submitted to the laboratory tests, namely; Robinson wing type, Robinson ball-and-funnel type, and American. The other six types of passenger connectors have not yet been delivered. We are advised that the Johnson passenger connectors have been built, are undergoing preliminary tests and will soon be ready for shipment to Purdue University. We are also advised that the Roberts passenger type connector will be delivered, but no date of delivery is obtainable. The people interested in the MacTaggart connector state that they wish to submit their connector for the tests but they are unable to give any approximate date as they are having difficulty in financing the manufacture of their connector due to the present business conditions.

The tests on the passenger type devices are divided into the following groups: 1. Tests with two passenger connectors equipped with metallic hose connections. 2. Tests with two passenger connectors equipped with rubber hose connections. 3. Tests with one passenger connector and one freight connector to determine if the freight and passenger connectors will operate satisfactorily together.

The laboratory tests on all of the automatic train line connectors so far submitted have been completed. Since the completion of the tests part of the men engaged on this work have been laid off and the others are engaged in working up the results of the tests and the preparation of a report. If no additional

connectors are received the report covering the connectors tested will be put in final form.

The train line connectors which have been tested are designed so that they may be used with the present standard car coupler. Several devices have been proposed which combine the car coupler and the train-line connections into a single device. The adoption of one of these devices would require the adoption of a new coupler as well as a train-line connector. We have delayed the consideration of this type of device until the completion of the investigation of train-line connectors which do not require a change of the present car couplers. It is now time to determine if this investigation should include the type of device which combines the car coupler and the train-line connections into a single device and the Director of Research would like to have your instructions on this matter.

The Director of Research has continued to make a monthly progress report to W. P. Borland, director of the Bureau of Safety of the Interstate Commerce Commission with copies to R. H. Aishton or M. J. Gormley, President of the American Railway Association; F. Walters, chairman, Joint Committee on Automatic Train Line Connectors; C. E. Chambers, chairman, Committee on Safety Appliances and V. R. Hawthorne, secretary, Mechanical Division. Representatives of the Bureau of Safety, the train-service brotherhoods, the railroads, and manufacturers of devices being tested have been present at various times during the conduct of the tests.

The report was signed by H. A. Johnson, Director of Research.

Automotive Rolling Stock

The report submitted by the Committee on Automotive Rolling Stock at the 1932 annual meeting included a table of rail cars put in service since 1922 up to and including the year 1931. During this nine year period 763 cars were placed in service. The average horsepower per car steadily increased from 97.5 in 1923 to 446 in 1931. This would seem to indicate that under the conditions that have existed for the past few years, the demand for small light motor cars has steadily decreased.

A second section of the committee report dealt with the streamlining of railway equipment with particular reference to rail motor cars. Since this report was made much more has been learned as regards the principles involved in streamline design, and the percentage of advantages accruing from such design. It may be stated with reasonable assurance that automotive railway equipment, both motor and trailing cars of efficient streamline design, can be quickly produced should the future traffic situation demand.

A question of much importance as regards the internal combustion-engine type of rail motive power has recently arisen. "Would it be more economical in the case of motor trains composed of several cars to have one car devoted primarily to the motive power equipment or would it be more economical to have the motive power equipment installed in the head-end section of a long car, the remaining portion of the car to be used for revenue service?"

It may be that the traffic requirements of the future will make desirable the design and development of light-weight, high-speed, streamline motor trains for passenger, mail, express and light package freight service. If so it would seem that the power plant could be installed in the head end section of a long car, streamlined to make it a component part of a streamlined motor train. Such a train might with suitable rates or tariffs be able to compete with the highway and airway forms of transport. Such motor trains would offer service and convenience especially as regards speed and comfort as is impossible to economically obtain with our present rolling stock. One railroad is at this time making a very complete and thorough study relative to such equipment. Other railroads are making thorough studies and investigations relative to the use of Diesel-electric power units for frequent fast freight service in coordination with highway transport. And one of the smaller railroads is making a detailed survey as regards the complete motorization of its entire property with the abandonment of all steam service and facilities necessary for operating steam service. It is planned to completely coordinate the motorized rail service with highway transport and marine connections.

It may be that the operating and maintenance forces will be called upon to agree to working rules compatible with such a modern transportation system. Such rules would improve the working conditions and would not decrease the employees' income.

Recently some financially strong and able manufacturers, as a result of their several years of research, experimentation and development, have decided that they can build suitable Diesel-electric automotive power plants for rail service of some 1,200 h.p. capacity, the purchase and use of which they believe will be economically justified.

Developments in Maintenance

It has been several years since automotive rolling stock was introduced into railway service. And it might be said that it has taken a great deal of time, study and effort on the part of those directly concerned with the operation and maintenance of such equipment to familiarize themselves to a degree with this new (to steam-railway men) type of motive power.

Within the last year several railroads have perfected detailed methods for the economic maintenance of automotive rolling stock and rail-motor equipment in general, and it is felt that the development of satisfactory methods of maintenance are equally if not more important than the development and improvement of this new form or type of prime mover.

The report was signed by E. Wanamaker (chairman), electrical engineer, Chicago, Rock Island & Pacific; H. F. Finnemore, assistant electrical engineer, Canadian National; B. N. Lewis, mechanical superintendent, Minneapolis, St. Paul & Sault Ste. Marie; F. K. Fildes, general foreman, Pennsylvania, and J. R. Jackson, engineer tests, Missouri Pacific.

Action.—The report of the committee was accepted.

Report of Arbitration Committee

During the year Cases 1702 to 1720, inclusive, have been decided and copies forwarded to the members.

Rules 14 and 49 are modified to provide for use of defect card receptacle where desired.

New paragraphs are recommended under Rule 113 to provide method of settlement in cases of cars destroyed or damaged on roads which are not subscribers to the Interchange Agreement, or on ferries or sea trains. This recommendation has been approved by representatives of the Car Service Division.

A new item is recommended under Rule 124 to provide that refunds shall be made in cases detected by the Mechanical Inspection Department of the Association, where owner has been billed for unnecessary repairs made in violation of Rule 1.

Modification of a number of the Passenger Interchange Rules which it is felt will clarify and simplify the billing work, are recommended as result of review and study of these rules by a special sub-committee appointed for that purpose.

All recommendations for changes in the Rules of Interchange submitted by members, railroad clubs, private car owners, etc., have been carefully considered by the Committee and, where approved, changes have been recommended.

Attention is again directed to the fact that the Arbitration Committee will not consider questions under the Rules of Interchange unless submitted in the form of Arbitration Cases as per Rule 123.

Freight-Car Rules

RULE 3

The committee recommends that the effective dates for various requirements in this rule as listed below, now set at January 1, 1934, be extended to January 1, 1935:

Section (b), Paragraph (7)—Brake beam hangers.
Section (d), Paragraph (3)—Draft key retainer.
Section (f), Paragraph (1)—Stake pockets on flat cars.
Section (f), Paragraph (2)—Stake pockets on flat cars.
Section (r), Paragraph (3)—Hatch covers not secured by hinges, on refrigerator cars.
Section (t), Paragraph (7)—Head block anchorage on tank cars.
Section (t), Paragraph (8)—Wood shims between longitudinal anchorage and underframe, on tank cars.
Section (t), Paragraph (13)—Dome covers not secured by hinge or chain, on tank cars.
Section (u), Paragraph (2)—Non-acceptance in interchange of cars of all-wood construction (Class F).
Section (u), Paragraph (3)—Non-acceptance in interchange of cars of all-wood underframe equipped with metal draft arms extending 24 in. or more beyond center line of body bolster (Class E-4).

Reason: The present situation justifies these extensions.

The committee recommends a new second paragraph to Section (h), to be included in the next supplement, to read as follows:

Proposed Form—(h) (2) *Hand brake connection between brake staff and rod must be of chain, effective January 1, 1935. From owners.*

Reason: To comply with requirements of the United States Safety Appliance Standards.

The committee recommends a new fourteenth paragraph to Section (t), to be included in the next suppplement, to read as follows:

Proposed Form—(t) (14) *Tank cars. In the application of new tanks to secondhand underframes and trucks, the underframe must at least conform to the A. R. A. Specifications for Class III Tank Cars effective May 1, 1917 to July 1, 1927; and trucks must be equipped with cast-steel side frames meeting A. R. A. Specifications. From owners.*

Reason: As recommended by the Committee on Tank Cars.

RULE 4

The committee recommends that Section (f) of this rule be modified as follows:

Proposed Form—(f) *All cars.*—When metal posts or braces are bent to the extent of being out of alignment *at* sheathing, *side sheets, side slats,* side planks or bolt or rivet holes: *or when bent account of contact from exterior, to the extent that the metal sheathing, side sheets, side slats or side planks are forced out of alignment;* or *when* the bending of posts or braces by raking prevents the proper operation of side doors.

Reason: To protect additional classes of cars having exposed posts and braces, and to clarify the intent.

The committee recommends that first paragraph of Section (g) of this rule be modified as follows:

Proposed Form—(g) (1) All cars.—Metal end sill only, when straightening of same is necessary for proper operation of uncoupling apparatus, or dumping device, or to restore safety appliances to *meet the I. C. C. safety appliance requirements,* or to repair cardable directly associated defective parts.

Reason: To clarify the intent of the rule and eliminate defect carding for minor damage which does not necessitate repairs.

RULE 5

The committee recommends that reference to color of printing of defect cards be eliminated from first paragraph of this rule; also, from cuts on pages 217 and 218 of the current Code showing form of Return Card and Bad Order Transfer Card.

Reason: As an economy measure.

The committee recommends that the extended time limits of second paragraph of this rule, as shown in the 1933 Code, be continued until January 1, 1935.

Reason: Account curtailment in car repairs resulting in holding of bad order cars under present conditions.

RULE 7

The committee recommends that first paragraph of Section (4) of this rule be modified as follows:

Proposed Form—(4) The original record, *or record repair card when written at the car,* must be signed by the authorized person making original inspection and the person making the complete inspection or by other authorized person making the original record, to vouch for the correctness of same.

Reason: To definitely indicate necessary signatures when combined form of record of repairs and billing repair card is written at the car.

RULE 9

The committee recommends that requirement to specify "Solid, filled, or other kind" opposite item of "Journal bearings, applied," be eliminated from this rule.

Reason: Account modification of Rules 19 and 66.

RULE 10

The committee recommends that the Recommended Practice Symbols for Marking Defective Wheels as contained in Section D of the A. R. A. Manual of Standard and Recommended Practice, be printed in the next edition of the Interchange Code.

Reason: For convenient reference, as recommended by the Committee on Wheels.

RULE 11

The committee recommends that this rule be eliminated.

Reason: First sentence eliminated as recommended by the Committee on Car Construction. Second sentence transferred to Rule 62 for better reference.

RULE 14

The committee recommends that last paragraph of this rule be modified, effective August 1, 1933, as follows:

Proposed Form—Defect cards and joint evidence cards must be securely attached to the car with at least four tacks, *at the locations described in Rule 49, paragraph (a), or placed in suitable receptacle as referred to therein.*

Reason: To provide for use of defect card receptacle where desired. It is considered unnecessary to repeat designated locations in this rule.

RULE 17

The committee recommends that a new third sentence be added to Section (g) of this rule, as follows:

Proposed Form—Fir, oak, southern pine or spruce may be substituted for each other in the renewing or splicing of running boards on tank cars.

Reason: Such substitution should be permissible.

RULE 18

The committee recommends that first paragraph of this rule be modified, and note added under this paragraph, to be included in the next supplement, as follows:

Proposed Form—Couplers, types D and E, with distance between point of knuckle and guard arm exceeding 5-5/16 in., as measured by gage shown in Fig. A on page 44, must have the defective part or parts renewed to bring coupler within gage. In the application of secondhand D and E couplers complete to foreign cars, distance between point of knuckle and guard arm must not exceed 5⅛ in., as measured by gage shown in Figure B on page 45. In the repair of D and E couplers by the application of knuckle, lock or pin, any or all, the distance between point of knuckle and guard arm must not exceed 5⅛ in., as measured by gage shown in Figure B on page 45. Coupler bars with cracks in *side* wall back of knuckle tails, shall not be removed from *foreign cars, unless—*

(a) Such crack is over 6½ in. in length located within an area 3 in. above and 3 in. below the horizontal center line of knuckle side wall, or

(b) Any crack more than 4 in. long and extending outside the areas of 3 in. above and 3 in. below the horizontal center line of knuckle side wall.

Note.—The 5⅛ in. limit referred to above should not be confused with the 4⅞ in. limit applicable to reclamation of knuckles as required in Circular DV-761 and referred to in Rule 23.

Reason: First paragraph modified as recommended by the Committee on Couplers and Draft Gears. Note added to clarify the intent.

RULE 19

The committee recommends that fifth requirement under this rule be modified, as follows:

Proposed Form—In making repairs to foreign cars, the following materials must not be used:

Malleable or steel-backed journal bearings, *or journal bearings with thickness of back through crown less than the following dimensions:*

For journals 7 in. long and over, but not 9 in. . . . .11/16 in.
For journals 9 in. long and over, but not 11 in. . . . .13/16 in.
For journals 11 in. long and over, but not 12 in. . . . .15/16 in.
For journals 12 in. long and over. . . . . .17/16 in.

Reason: As recommended by the Committee on Car Construction.

RULE 20

The committee recommends that first paragraph of this rule be modified, as follows:

Proposed Form—Cars must be maintained within the limits of standard height for couplers, measured from the top of the rails to *center of face of coupler knuckle.* As far as possible, *adjustment should be made when cars are empty.*

Reason: As recommended by the Committee on Car Construction.

RULE 21

The committee recommends a new Section (c) to this rule which is headed "Bills may be rendered against car owners:", to read as follows:

Proposed Form—(c) For other temporary repairs, only when authorized by car owner.

Reason: To clarify the intent.

RULE 23

The committee recommends that twelfth item under Section II of this rule be modified in the next supplement, as follows:

Proposed Form—II. Welding cracks or fractures (by autogenous or other method), will not be permitted on the following:

Coupler yokes, *except cast-steel yokes as specified in Section IV.*

Reason: To eliminate confliction with Section IV.

The committee recommends the addition of a new paragraph to Section IV of this rule which is headed "Welding cracks or fractures will be permitted on the following:", to read as follows:

Proposed Form—Spring planks, one-piece, may be welded when cracked or broken, as follows:

1. Cracked or broken crosswise, any location; providing crack

or fracture does not extend within two inches of longitudinal center line.

2. When cracked or broken adjacent to side frame, spring plank must be removed for welding.

3. Holes, for securing to column or side frames, worn.

4. Spring seat split longitudinally through flange radius.

5. Checks or cracks extending outwardly from any hole.

6. Where, due to corrosion, thickness is reduced to less than ¼ in. spring planks must not be welded.

7. Angle type, or two-piece spring planks, must not be welded.

Reason: As recommended by the Committee on Car Construction.

RULE 24

The committee recommends that in the next edition of the Interchange Code this rule be combined with Rule 25 and relocated as new Rule 69.

Reason: For easier reference.

RULE 25

The committee recommends that last paragraph of this rule be modified, effective August 1, 1933, as follows:

Proposed Form—A. R. A. *double plate* cast-iron wheels *must not be* mated with A. R. A. *single* plate cast-iron wheels.

Reason: In view of impending restrictions for application of double plate wheels.

The committee also recommends that in the next revision of the Interchange Code this entire rule be combined with Rule 24 and relocated as new Rule 69.

Reason: For easier reference.

RULE 32

The committee recommends that the first sentence of the fifth paragraph of this rule be modified as follows:

Proposed Form—Removing or cutting out parts of car to facilitate loading, unloading or for other purposes, except holes not exceeding 1½ in. in diameter each, in sides, ends or floors of gondola cars or 4½ *in.* in floors of flat cars, for the purpose of securing lading in compliance with the Loading Rules.

Reason: Figure 70-A of the Loading Rules permits holes of this dimension in floors of flat cars.

The committee recommends that Sections (b) and (d) of this rule be modified as follows:

Proposed Form—(b) Cornering; sideswiping; misplaced switches; wrong or mis-interpreted signals or failure to give or to observe signals; *or* letting cars get away on incline.

(d) Impact switching: Damage to extent shown in Rule 44 will be delivering company responsibility. Damage to less extent will be owner's responsibility except where caused under conditions referred to in Sections (a), (b) or (c). *The foregoing provisions will apply also to cars handled through car retarding device.*

Reason: To clarify the intent.

RULE 36

The committee recommends that present second paragraph of Section 3 of this rule be modified as new second, third and fourth paragraphs, to be included in the first suppplement, as follows:

Proposed Form—Placards or certificates missing from cars containing explosives and other dangerous articles, *or placards improperly exposed,* must be replaced *or reversed in accordance with current Interstate Commerce Commission Regulations.*

Placards, commodity cards and certificates on empty cars (except special dome placards and the optional "Dangerous-Empty" placards as per paragraphs 245, 709 and 710 of the Interstate Commerce Commission Regulations), must be removed, *replaced or reversed, in accordance with current Interstate Commerce Commission Regulations.*

Defect cards covering the application, removal, *replacing* or *reversal* of such placards or certificates, *in accordance with current Interstate Commerce Commission Regulations,* and also removal of commodity cards from empty tank cars, must be furnished for cars received in interchange and charges thereon billed in accordance with Rule 107.

Reason: To provide for use of reversible placard on tank cars equipped with permanent metal holders.

RULE 49

The committee recommends that Paragraph (a), and last sentence of Paragraph (b), of this rule be modified, effective August 1, 1933, as follows:

Proposed Form—(a) All-steel cars not equipped with cardboards *or suitable receptacle for the accommodation* of defect and joint evidence cards. Same to be located either on cross tie under car or inside of side sill at end of car, or on center sills of cars equipped with center sills only. Size of cardboard, *if used, shall not* be less than 5½ by 9 in. *On composite underframe cars having wood intermediate sills of dimensions sufficient for attaching defect cards, a suitable receptacle for defect and joint evidence cards may be applied to outside face of intermediate sill at approximately center of car.*

Note.—Suitable receptacle referred to above may not be applied to foreign cars except with consent of owner.

(b.—last sentence). Size of cardboard *shall* be not less than 5½ by 9 in.

Reason: To provide for use of defect card receptacle and specify locations for attachment to car.

RULE 60

The committee recommends that Paragraphs (a) and (b) of this rule be modified in the next supplement to the current Code, as follows:

Proposed Form—(a) *Standard air brake markings, as shown in cut on page 95,* are required on *all* cars.

(b) Cylinders and triple valves not cleaned within fifteen months, as *indicated* by standard markings, *must be cleaned.* After the expiration of twelve months, if car is on repair track for other work, the air brakes may *also* be cleaned. After the expiration of fourteen months, the air brakes may be cleaned *regardless* of whether *or not* car requires other repairs.

Reason: To definitely indicate that standard markings are required on all cars and to provide for extension of air brake cleaning dates as announced in Circular DV-797.

Note.—Additional changes in this rule, note following and Interpretation No. 4 thereto, as result of extended time limits announced in Circular DV-797, which have been approved by letter ballot (Circular DV-800), will also appear in the next supplement to the Interchange Code.

RULE 61

The committee recommends that this rule be modified in the next supplement, as follows:

Proposed Form—In connection with *periodical* repairs to air brakes, or when car is on repair track for other work, the brake levers shall be checked to assure their conformity with standard dimensions shown on metal badge plate attached to car. Wrong brake levers or wrong brake rods shall be replaced with standard to car at owner's expense, *except where brake levers on car are of same ratio as dimensions on badge plate.* Brake hangers, hanger pins and brackets shall also be checked in accordance with the condemning limits shown in Rule 63 and renewed or repaired if necessary. Charge shall be confined to repairs or renewals of these details, no charge permissible for inspection.

Reason: It should not be permissible to change the rods or levers unless braking power standard to car is affected.

RULE 62

The committee recommends the addition of a new third paragraph to this rule, as follows:

Proposed Form—In replacing journal bearings on foreign cars, new (or relined) bearings must be used to justify bill.

Reason: Transferred from Rule 11, for better reference.

RULE 66

The committee recommends that Section (j) of this rule be modified as follows:

Proposed Form—(j) Journal bearings shall be considered as requiring renewal:

1. When back or lug is broken or cracked.
2. *When worn ¼ inch or more lengthwise at either end, or when the combined wear lengthwise from such cause is ⅜ in. or more.*
3. When lining is loose or cracked.
4. When lining is worn through to brass.
5. When lining is spread over side.
6. *When contour of brass is not suitable for size of journal on axle applied.*

Reason: As recommended by the Committee on Car Construction.

RULE 67

The committee recommends that this rule be bracketed "Owners responsible," to clarify the intent.

RULE 69

The committee recommends that Rules 24 and 25 (as revised), be combined and relocated as new Rule 69, as follows:

Proposed Form—When mounting, two wheels of different tape size must not be applied to the same axle.

New wheels must not be mated with second-hand wheels.

One-wear wrought-steel wheels must not be mated with multiple-wear wrought-steel wheels.

A. R. A. double plate cast-iron wheels must not be mated with A. R. A. single plate cast-iron wheels.

Reason: For easier reference.

RULE 73

The committee recommends that this rule be modified, effective August 1, 1933, as follows:

Proposed Form—Worn through chill: See paragraphs 102 and 103 and Fig. 76 in Wheel and Axle Manual for identification of this defect. Wheel shall not be removed from service if tread

is not out of round in excess of 1/16 in. within an arc of 12 in. or less *and then only if worn through chill.* Care shall be taken to distinguish this defect from flat spots caused by sliding wheels.

(No change in note).

Reason: As recommended by the Committee on Wheels, to clarify the intent.

RULE 75

The committee recommends that present interpretation following this rule be eliminated and new note incorporated following the first paragraph, effective August 1, 1933, as follows:

Proposed Form—Brake burn: Cast-iron wheels with transverse cracks or comby treads due to heating. See paragraphs 107 to 109 and Figs. 81 to 90 in Wheel and Axle Manual.

Note.—Wheels, cast-iron, should be condemned if the checks or cracks extend into the throat of the flange or are in the flange or, when in the tread, are over 2¾ in. in length. Skid burned wheels should ordinarily be left in service until comby spot 2½ in. long or over develops, or two such adjoining spots each 2 in. or over develop.

Thermal cracks: Cast-steel, wrought-steel or steel-tired wheel. See paragraph 35 and Figs. 40 to 44 in Wheel and Axle Manual.

Reason: As recommended by the Committee on Wheels.

RULE 82

The committee recommends that last sentence of Section (c) of this rule be eliminated, effective August 1, 1933, as follows:

Proposed Form—(c) Tread worn hollow: Cast-iron wheels removed from service account condition of axle or mate wheel shall be classed as scrap if tread is worn so that projection on under side of gage (Fig. 8-A applied as shown in Fig. 4-D), clears tread of wheel at any point on circumference.

Reason: As recommended by the Committee on Wheels.

RULE 87

The committee recommends that first paragraph of this rule be modified in the next supplement to the current Code, and that the extended time limit involved be continued in effect until January 1, 1935, as follows:

Proposed Form—Any company making improper repairs by using material which the repairing line should carry in stock, as prescribed in Rule 122, is solely responsible to the owners, with the exception of the cases provided for in Rule 57. Such improper repairs must be corrected within *twenty-one* months after first receipt of car on home line, to justify bill. In all cases of improper repairs where defect card is attached to car, a notation to that effect should be made on the billing repair card.

Reason: To harmonize with Rules 5 and 94.

RULE 94

The committee recommends that the extended time limits of first paragraph of this rule, as shown in the 1933 Code, be continued until January 1, 1935.

Reason: Account curtailment in car repairs resulting in holding of bad order cars under present conditions.

RULE 98

The committee recommends that a new fifth paragraph be added to Section (c) of this rule, and present Interpretation No. 12 eliminated, as follows:

Proposed Form—(c) (5) *Where an axle applied by a foreign road is condemned by another foreign road within 90 days from date of application account journal length exceeding, or journal diameter being below A. R. A. limits for reapplication, and a controversy arises as to the accuracy of dimensions shown on billing repair cards, in the absence of conclusive evidence as to which road is actually responsible, the expense of renewal of said axle (secondhand value, less scrap credit) shall be equally divided between the two foreign roads involved.*

Note.—Axles scrapped account below A. R. A. limit in wheel seat or center will not be subject to this method of adjustment, regardless of date of previous application.

Reason: To provide an equitable method of settlement in cases of variance in dimensions of journal diameter. Also, to eliminate Interpretation No. 12.

The committee recommends that second paragraph of Section (g) of this rule be modified, as follows:

Proposed Form—The amount of service metal on both wheels will be governed by the minimum amount on either wheel, except when a wheel is necessarily scrapped *on account of defective or reaching limit of wear*, the service metal on mate wheel will be credited on basis of the actual amount *if in excess of 3/16 inch above condemning limit based on full flange contour.*

Reason: To provide proper credit for serviceable A. R. A. Standard material removed.

RULE 99

The committee recommends the addition of a new last sentence to this rule, and that present interpretation following the rule be eliminated, effective August 1, 1933, as follows:

Proposed Form—Car owner is responsible for first application of journal bearing, except:

1. When applied account missing.

2. When applied at time wheels and axle are renewed or removed and replaced (same location) account delivering company's defect.

3. When applied account damaged under any of the conditions enumerated in Rule 32.

Reason: It is felt charge for first application of journal bearing versus car owner is justified regardless of cause of removal in all cases except as specified above. Also, to eliminate present interpretation to the rule. This change will abrogate Decision No. 1701.

RULE 113

The committee recommends two additional paragraphs under this rule, to become effective August 1, 1933, as follows:

Proposed Form—When a car owned or controlled by a railway company is damaged or destroyed on the tracks of a road which is not a subscriber to the Interchange Agreement of the American Railway Association, the subscriber road delivering the car to such non-subscriber road shall be responsible to the owner for damage to or destruction of the car while in possession of the non-subscriber.

In case of damage to or loss of cars owned or controlled by a railway company, occurring while in possession of steamship, ferry or barge line which is not a subscriber to the Interchange Agreement of the American Railway Association, in the absence of proper authority for such delivery, responsibility to car owner shall devolve upon the delivering line. However, in the event car owner has given permission in accordance with the provisions of Car Service Rule 4 to make such delivery, the responsibility for loss of or damage to the car shall be settled between car owner and the water transportation carrier.

Reason: To provide method of settlement under such circumstances.

RULE 124

The committee recommends that a new Paragraph (2-b) be added to Section B of this rule under heading "Refunds shall be made for improper charges as follows," and present Paragraph (2) renumbered as Paragraph (2-a), as follows:

Proposed Form—(2-b). In cases detected where owner was billed for unnecessary repairs in violation of Rule 1.

Reason: To prohibit the practice of performing extensive and unnecessary repairs to foreign cars.

Passenger Car Rules of Interchange

PREFACE

The committee recommends that a new fourth item be added to the Preface, effective August 1, 1933, as follows:

Proposed Form—4. Providing an equitable basis for charging line service expense items.

Reason: To complete preface as to the intent of these rules with respect to line service expense items.

PASSENGER RULE 2

The committee recommends that the effective dates of both first and second sentences of Section (c) of this rule pertaining to metallic steam heat connectors, now set at October 1, 1933, and January 1, 1934, respectively; and the effective date of Section (d) of this rule pertaining to platform safety chains, now set at January 1, 1934; be extended for one year.

Reason: The present situation justifies these extensions.

PASSENGER RULE 3

The committee recommends that this rule be modified, effective August 1, 1933, as follows:

Proposed Form—Passenger equipment cars operating in interchange shall be divided into two classes of service as follows:

(a) Line Service: Cars operating *regularly* under an approved operating agreement over two or more systems of railroads *from designated terminal of originating line to designated terminus of line. This includes extra cars assigned to handle overflow business, providing they move the entire length of established line.*

Note.—In event line car is set out enroute account mechanical defects and another car substituted, line service expense shall be confined to full line mileage proportion of expense at originating terminal on original line car only.

(b) Interchange Service: Cars moving over two or more systems of railroads, the operation of which does not comply with the requirements of line service. *This also includes trains used for the movement of troops.*

(c) (Transferred to new Rule 10.)

Reason: To more clearly define line service cars and definitely provide for status of extra cars. This change will abrogate Decision No. 1690.

Passenger Rule 6

The committee recommends that this rule be modified, effective August 1, 1933, as follows:

Proposed Form—The expenses of passenger equipment cars operated in interchange or line service shall be divided into *three* classes, namely:

(a) Owner's defects.

(b) Delivering company's defects.

(c) Line service expense, proratable on a mileage basis against the roads comprising the line, *unless otherwise provided by special agreement.*

(d) (Eliminated, account elimination of Rule 10).

Reason: To eliminate Section (d) and make clear that charge is permissible under Section (c) in the absence of special agreement.

Passenger Rule 7

The committee recommends that first and second paragraphs of Section (c) of this rule be modified, effective August 1, 1933, as follows:

Proposed Form—Owner's defects are as follows:

(c) Chimneys, wicks, burners, shades, and all other fittings of oil-lighting equipment.

Mantles, tips, burners, domes, globes, bulbs, bowls, and all other fittings of gas-lighting equipment.

Reason: Car owner should be responsible for these details in all cases.

The committee recommends that third paragraph of Section (c) of this rule be modified, effective August 1, 1933, as follows:

Proposed Form—Fuses, incandescent bulbs, shades, belts, current, wiring, *flushing batteries (except material cost of distilled water for batteries)*, and all other parts of electric-lighting equipment.

Reason: Account elimination of Rule 10 under which charge for above was permitted in addition to the mileage charge.

The committee recommends that Section (d) of this rule be modified, effective August 1, 1933, as follows:

Proposed Form—(d) All defective or missing inside or concealed parts of car, including tools and emergency repair parts, missing from either inside or outside of all cars, *except as provided in Rule 8.*

Reason: To eliminate confliction with Rule 8.

The committee recommends that fifth paragraph of Section (f) of this rule be modified, effective August 1, 1933, as follows:

Proposed Form—(f) (5) Worn flange—cast-iron wheels: Flanges having flat vertical surface extending ⅞ in. or more from tread, or flanges 1 in. thick or less, gaged at a point ⅜ in. above tread.

Gage for condemning worn flanges of cast-iron wheels under passenger cars should be the same as is used for condemning worn flanges of cast-iron wheels under freight cars of 80,000 lb. capacity or over (See Figs. 3 and 4 of freight code).

Cast-iron wheels: The freight car code requirements applicable to remount gage limits for tread and flange; to wheels below nominal weight, or having no cast weight; and to wheels with bore exceeding A. R. A. Standard diameter; also apply to cast-iron wheels in service under passenger train cars.

Reason: To clarify the intent.

The committee recommends that first paragraph of Section (g) of this rule be modified as follows:

Proposed Form—(g) (1) Cars must be maintained within the limits of standard height for couplers, measured from the top of the rails to *center of face of coupler knuckle.* As far as possible, *adjustment should be made when cars are empty.*

Reason: As recommended by the Committee on Car Construction.

The committee recommends that first paragraph of Section (h) of this rule be modified, and note added under this paragraph, to be included in the next supplement, as follows:

Proposed Form—(h) (1) Couplers, types D and E, with distance between point of knuckle and guard arm exceeding 5-5/16 in., as measured by gage shown in Fig. A of Freight Rule 18, must have the defective part or parts renewed to bring coupler within gage. In the application of secondhand D and E couplers complete to foreign cars, distance between point of knuckle and guard arm must not exceed 5⅛ in., as measured by gage shown in Fig. B of Freight Rule 18. In the repair of D and E couplers by the application of knuckle, lock or pin, any or all, the distance between point of knuckle and guard arm must not exceed 5⅛ in., as measured by gage shown in Fig. B of Freight Rule 18. Coupler bars with cracks in side wall back of knuckle tail, shall not be removed from *foreign cars, unless—*

(a) Such crack is over 6½ in. in length located within an area 3 in. above and 3 in. below the horizontal center line of knuckle side wall, or

(b) Any crack more than 4 in. long and extending outside the areas of 3 in. above and 3 in. below the horizontal center line of knuckle side wall.

Note.—The 5⅛-in. limit referred to above should not be confused with the 4⅞-in. limit applicable to reclamation of knuckles as required in Circular DV-761 and referred to in Freight Rule 23.

Reason: First paragraph modified as recommended by the Committee on Couplers and Draft Gears. Note added to clarify the intent.

Passenger Rule 8

The committee recommends that a new third paragraph be added to Section (a) of this rule, effective August 1, 1933, as follows:

Proposed Form—Delivering line defects are as follows:

(a) Removing or cutting out parts of car to facilitate loading or unloading.

Theft of parts of car where handling line knows such theft occurred while car was in its possession.

Where handling line has knowledge of concealed fire damage occurring while car is in its possession, it shall assume responsibility for same.

Reason: Damage under such circumstances should properly be assumed by handling line.

The committee recommends that Section (d) of this rule be eliminated, effective August 1, 1933.

Reason: Unnecessary, covered in Rule 5.

Passenger Rule 9

The committee recommends that this rule be modified, effective August 1, 1933, as follows:

Proposed Form—Line Service expense items are as follows:

Proposed Form—(a) Terminal cleaning. *Charge to be made only at originating terminal of established line and when work is performed in accordance with Rule 21. Special cleaning, as per Item 14 of Rule 21, may be performed and charged only as agreed by parties comprising line.*

(b) Heating. *Charge to be made in accordance with Rule 22 and will apply only when furnished at originating terminal of established line; or coal* furnished for individual heaters.

(Eliminated, account change in Rule 7.)

(c) Lubrication. *Charge to be made in accordance with Item 21 of Rule 22 only at originating terminal of established line,* except periodic repacking as referred to in Section (1) of Rule 7.

(d) *Supplies.* Illuminating oils, water and ice, drinking cups, toilet soap, *deodorizing liquids or tablets,* and towels are not a line expense. Coal, wood and charcoal are not a line expense unless used as specified in paragraph (*b*) *for cars in line service.*

(Eliminated, account new Rule 10.)

(e) *Drinking Water Containers. Cleaning and Steaming, when performed periodically, to be charged as per Item 17 of Rule 21.*

(f) *Cost of coal furnished for operating head-end lighting system, also cost of attendant (when furnished) for operating such equipment.*

Note.—Cost of precooling cars by mechanical device may be charged only in case of special agreement by parties comprising line.

Reason: To confine charge for line service expense items to work performed at originating terminals (unless covered by special agreement); and to provide for periodic cleaning and steaming of drinking water containers and precooling of cars by mechanical device. Section (f) added account elimination of Rule 10 under which this charge was permitted in addition to the mileage rate.

Passenger Rule 10

As announced in circular letter to the members under date of March 31, 1933, due to revision of Car Service Rule 8 which combined the charge for the use of electric lighting equipment with the rental rates of passenger train cars, Passenger Interchange Rule 10 was eliminated from the Code of Interchange Rules effective April 1, 1933.

The committee recommends that a new rule be added to the Code, effective August 1, 1933, as follows:

Proposed Form—Interchange Service expense items to be assumed by handling line, are as follows:

1. Ordinary daily cleaning, sweeping and dusting interior, wiping down and washing exterior, cleaning windows, etc.

2. Lubrication, except periodical repacking.

3. Terminal heating.

4. Illuminating oils, water and ice, drinking cups, toilet paper, toilet soap, towels, coal, wood and charcoal.

5. Steaming and cleaning of drinking water containers.

Note.—If above service is performed on private or business cars, the cost shall be charged against the car owner.

Reason: This expense is assumed by handling line and should be divorced from Line Service expense items shown in Rule 9. Also, to eliminate interpretation following Rule 21.

Passenger Rule 11

The committee recommends this rule be eliminated, effective August 1, 1933.

Reason: Account elimination of former Rule 10 covering electric lighting.

PASSENGER RULE 12

The committee recommends that Section (b) of this rule be eliminated effective August 1, 1933.

Reason: Account of change in Rule 19.

PASSENGER RULE 19

The committee recommends that first paragraph of this rule be modified, effective August 1, 1933, as follows:

Proposed Form—Bills for maintenance of passenger cars should be handled as provided in Rules 91 to 97, inclusive, of the freight code of rules. Original record of repairs and billing information shall be prepared as required in the freight car rules *except that box numbers where marked on truck shall be reported for wheels, brake beams, journal boxes and contained parts.*

Reason: To conform to requirements of Rule 9 of the Freight Code.

The committee recommends that Item (d) of second paragraph of this rule be eliminated, effective August 1, 1933.

Reason: Elimination of former Rule 10 covering electric lighting.

The report was signed by T. W. Demarest (chairman), general superintendent motive power, Pennsylvania; W. H. Flynn, general superintendent motive power and rolling stock, New York Central; J. J. Hennessey, assistant superintendent car department, Chicago, Milwaukee, St. Paul & Pacific; T. Beaghen, Jr., superintendent car maintenance, Mexican Petroleum Corporation; C. T. Ripley, chief mechanical engineer, Atchison, Topeka & Santa Fe; L. Richardson, mechanical assistant to the vice-president and general manager, Boston & Maine; M. F. Covert, general superintendent equipment, General American Car Company, and G. E. McCoy, assistant general superintendent car equipment, Canadian National.

Action.—The report of the committee was accepted.

Report on Brakes And Brake Equipment

Undesired Emergency L-2 Triple Valves—Some time ago complaint was made by several railroads of periodical cases of undesired emergency action with the L-2 triple valves in passenger service. It transpires that various railroads in repairing the L-2 triple valve are substituting the old type graduating springs and caps in cases where the L-2 triple valve is removed from cars on their lines, thus burdening the car owners who introduce this improvement.

We recommend all railroads be advised that, in cases where the L-2 triple valve has been equipped with graduating spring Westinghouse Air Brake Company, Piece No. 92073 and cap Westinghouse Air Brake Company, Piece No. 92074, foreign lines, in repairing such valves, maintain these features in kind.

Welding of Brake Heads—The question of building up worn surfaces on brake heads has been considered by this committee on several occasions and their position has been that welding should not be permitted with malleable brake heads. Recently the committee again considered the question and referred the matter to the Committee on Specifications for Materials for their opinion with reference to the practicability of work of this character. The recommendation of the Committee on Specifications for Materials is as follows:

"On malleable iron, the weld heat changes the structure of the base metal to a white cast iron which is brittle and unsuited for tensile stresses, but experience has shown where the weld is in compression, as on brake heads, the weld stands up in service and will not break loose.

"In restoring worn surfaces by welding with iron or steel wire by the electric or oxy-acetylene process, the electric process is considered the better because of being quicker and giving less penetration of heat into the body of the casting.

"This committee suggests to the Committee on Brakes & Brake Equipment, that Section three of Rule 23 be modified to permit welding of worn surfaces on brake heads, both steel and malleable iron. Cracks in malleable iron heads should not be repaired by welding, as the structural change in the iron causes brittleness and inability to stand tensile stresses."

This Committee now concurs with the suggestions of the Committee on Specifications for Materials and recommends that Section three of Rule 23 be modified in accordance therewith.

Retaining Valves—For several years a number of railroads have complained of difficulty with brakes failing to release on account of retaining valves and pipe connections being stopped up by mud-bees or wasps building their nests therein. Recently the air brake companies designed a new type of plug in the form of a cap having a number of small slotted openings. Several railroads, at the present time, are putting these devices into service. So far they seem to be entirely satisfactory and we would suggest a liberal application of these latter devices by the various railroads who experience difficulties of this character and if the service of this device seems to merit such consideration, the committee will later on make recommendations with respect there-to.

Emergency Valves—Some time ago the Illinois Central submitted for approval of the Brake Committee, a modification of the present emergency valve and piston used in the K triple valve, in order to overcome cases of bent emergency valve stems.

The wing type shown in Fig. 1 is the type of valve originally submitted. Several thousand of these have been in service on Illinois Central cars for the past four years or more. This is the type recommended by this Committee originally.

The short-stem type used with the present standard piston is illustrated in Fig. 2. This type of valve was developed by the Westinghouse Air Brake Company subsequent to the one developed by the Illinois Central, and has not been tested by this committee. No formal request or submission has been made

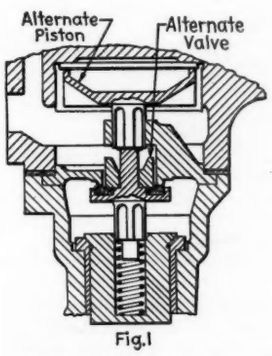


Fig.1

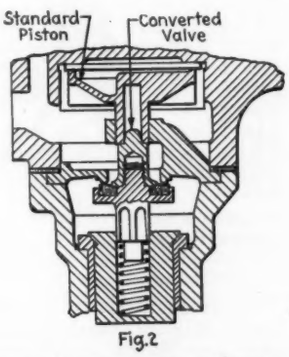


Fig.2

The wing and short stem types of emergency valves

to the Brake Committee by the Air Brake Company requesting approval for the use of the short stem type. However, a submission of this device to the committee was made by one of its members and the committee agreed to include this device in their recommendations.

We recommend that the Arbitration Committee permit the use of the wing type valve and piston shown in Fig. 1 and the short stem type shown in Fig. 2 in the interchange of freight equipment.

Location of Feed Grooves—Circular DV-800, triple valve gages, provides that all triple valves being tested upon the A. R. A. standard test rack designated by the air-brake companies as 3-T, will have the feed-groove location checked with a device designed for that purpose.

This gage was not shown in the list of gages mentioned in circular DV-800 because it applied to the checking of the feed-groove location under conditions wherein it is not necessary to use the gages listed in that circular. It must, therefore, be made a part of the A. R. A. freight triple-valve test rack, and we therefore recommend submitting to letter ballot for adoption as standard, the following:

"A. R. A. standard triple valve test racks must be equipped with a device for locating the position of the feed groove. The device shown in Fig. 1, as furnished by the air brake manufacturers, or its equivalent, will meet the above requirements."

Standard Brake Beam

A large part of this year's report was devoted to a consideration of the standard brake-beam designs which have been developed by the sub-committee. The report takes up in great detail the reasons for the selection of the designs of the several component parts, including the brake-shoe and key, due to certain revisions being contemplated in the brake head suggested for use as a part of the standard beam. The recommendations of the joint sub-committee were arrived at after co-operative efforts with the brake-beam manufacturers and these recommendations are concurred in by the latter. Fig. 3 shows an assembly drawing of the recommended beam which has been designated as A. R. A. Standard No. 15. The reasons set forth by the committee for the selection of the compression member shown are as follows:

(a) It has been referred to in the Manual of Standard and Recommended Practice since 1913 or for nearly 20 years.

(b) It is interchangeable with the great majority of existing brake beams.

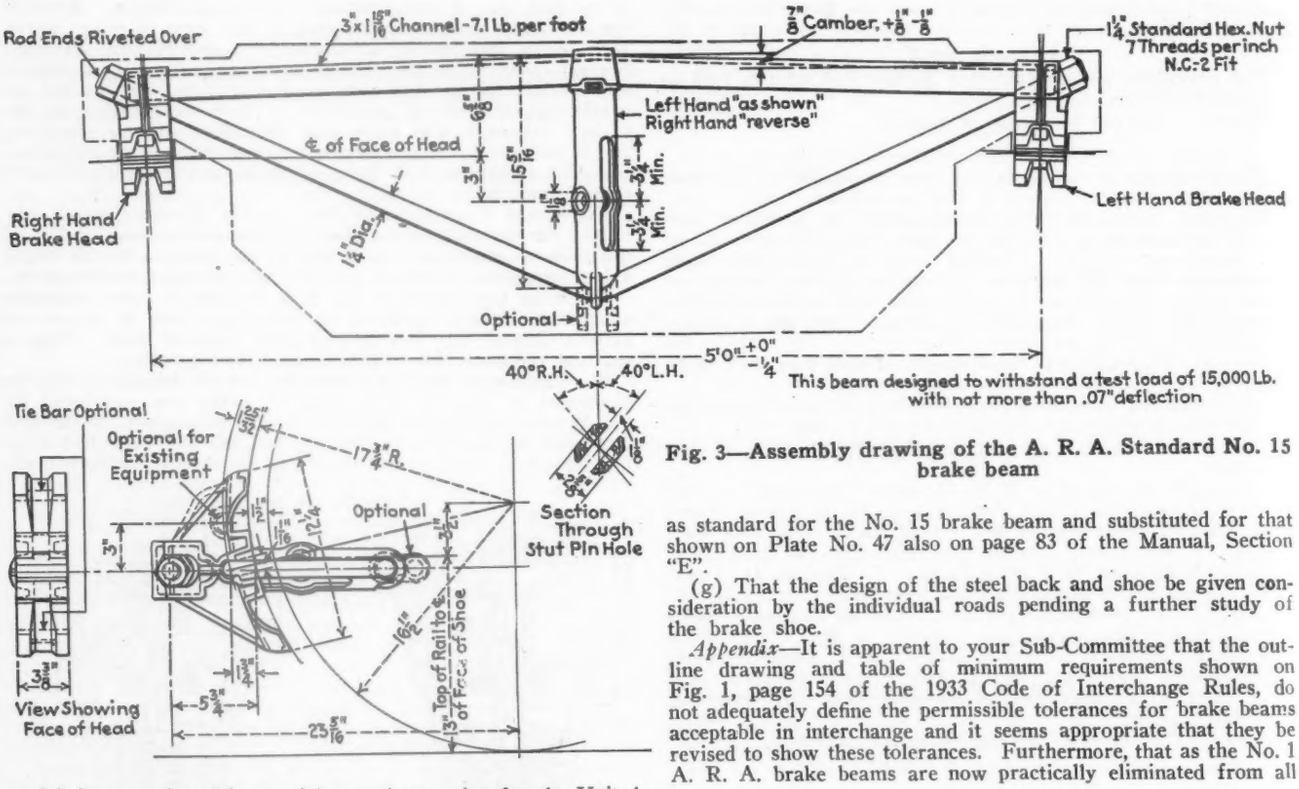

Rod Ends Riveted Over
3"x1 15/16" Channel - 7.1 Lb. per foot
7/8" Camber, +1/8" -1/8"
1 1/4" Standard Hex. Nut 7 Threads per inch N.C.-2 Fit
Left Hand "as shown" Right Hand "reverse"
℄ of Face of Head
Right Hand Brake Head
Left Hand Brake Head
1 1/4" Dia.
Optional
5'0" +0" -1/4"
40° R.H.
40° L.H.
This beam designed to withstand a test load of 15,000 Lb. with not more than .07" deflection
Tie Bar Optional
Optional for Existing Equipment
17 3/4" R.
Optional
Section Through Stut Pin Hole
View Showing Face of Head
Top of Rail to ℄ of Face of Shoe

Fig. 3—Assembly drawing of the A. R. A. Standard No. 15 brake beam

(c) It was selected by special committee action for the United States Railroad Administration and employed in the brake beams applied to 100,000 freight cars built to the U. S. R. A. specifications.

(d) Brake beams employing this type and dimension of compression member fully meet all the A. R. A. test requirements.

(e) It is a commercial section which affords both the manufacturers and the railroad the benefits of an open market.

The committee fails to find evidence to warrant increasing the tension member from 1¼ in. to 1-⅜ in. in diameter, believing the former ample for the 15,000-lb. deflection load.

Conclusions—Having spent a considerable time on the various phases, such as we know of, surrounding the whole brake beam question we are satisfied that a very considerable and unnecessary amount of money is involved on the part of both the railroads and the manufacturers as a result of the present state of the matter.

That these unsatisfactory conditions are aggravated by the use of brake beams and parts not coming within A. R. A. requirements and gauge limitations.

That brake beam maintenance generally is of poor quality and testing after repairs is not generally done.

That inspections made of manufactured brake beams, brake shoes and brake shoe keys by railroads generally is not sufficiently close to insure their meeting the A. R. A. specifications and requirements.

That the brake beam parts and assembly referred to in Figs. 1—6 will meet the requirements for a common standard and permit the manufacturers some latitude in both design and detail.

That it will be a decided advantage to all railroads if a standard brake beam, brake shoe and brake shoe key is adopted and effectively maintained.

Recommendations—After many conferences with the manufacturers and due consideration of the problems and conditions involved we respectfully submit the following for your consideration and approval:

(a) That this brake beam be designated and identified as the A. R. A. standard No. 15 brake beam.

(b) That the compression and tension member be adopted as standard for the No. 15 brake beam.

(c) That the brake head be adopted as standard for the No. 15 brake beam and substituted for those shown on Plates Nos. 32 and 47, also on pages 84, 86 and 87 of the Manual, Section "E".

(d) That the brake shoe key be adopted as standard and substituted for that shown on page 90, Section "E" of the Manual.

(e) That the strut be adopted as standard for the No. 15 brake beam and substituted for that shown on Plate No. 28, also on page 91 of the Manual, Section "E".

(f) That the brake beam assembly shown in Fig. 3 be adopted as standard for the No. 15 brake beam and substituted for that shown on Plate No. 47 also on page 83 of the Manual, Section "E".

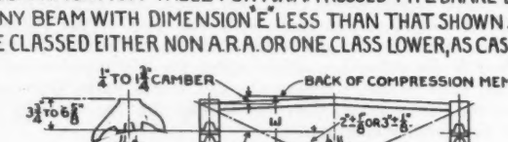
(g) That the design of the steel back and shoe be given consideration by the individual roads pending a further study of the brake shoe.

Appendix—It is apparent to your Sub-Committee that the outline drawing and table of minimum requirements shown on Fig. 1, page 154 of the 1933 Code of Interchange Rules, do not adequately define the permissible tolerances for brake beams acceptable in interchange and it seems appropriate that they be revised to show these tolerances. Furthermore, that as the No. 1 A. R. A. brake beams are now practically eliminated from all

BRAKE BEAMS.

THE FOLLOWING ILLUSTRATION (FIGURE 1) IS TO BE USED FOR IDENTIFYING ALL A.R.A. No.2. No.2+, No.15 AND No.3. BRAKE BEAMS. ALL BEAMS NOT CONFORMING THEREWITH SHALL BE CHARGED AND CREDITED AS NON A.R.A. BRAKE BEAMS.

IDENTIFICATION TABLE FOR A.R.A. TRUSSED TYPE BRAKE BEAMS. ANY BEAM WITH DIMENSION "E" LESS THAN THAT SHOWN SHALL BE CLASSED EITHER NON A.R.A. OR ONE CLASS LOWER, AS CASE MAY BE



NOTE:-DIMENSIONS OTHER THAN "E" ARE NOMINAL AND SUBJECT TO ROLLING MILL TOLERANCES.

A.R.A. CLASS.		No.2.	No.2+	No.15	No.3.
DEFLECTION LOAD		12000	15000	15000	18000
TABLE I.	A	2 3/8"	2 3/8"		2 3/8"
	B	2 3/16"	2 3/16"		2 3/16"
	C	5/16"	5/16"		5/16"
	D	1 1/8"	1 1/8"		1 3/8"
	E	13 1/2"	14"		15"
TABLE II.	A	2 1/8"	2 1/8"		
	B	2 1/2"	2 1/2"		
	C	3/16"	3/16"		
	D	1 1/8"	1 1/4"		
	E	13 1/2"	14"		
TABLE III.	A	3"	3"	3"	3"
	B	1 13/16"	1 7/8"	1 7/8"	1 15/16"
	C	5/16"	1/4"	1/4"	1/4"
	D	1 1/8"	1 1/4"	1 1/4"	1 3/8"
	E	13 1/2"	14"	15 3/16"	15"
TABLE IV.	A	3"	3"		3"
	B	1 1/2"	1 1/2"		1 7/8"
	C	7/32"	1/4"		1/4"
	D	2 1/2"	2 5/8"		2 5/8"
	E	13 3/4"	13 3/4"		14 1/2"
TABLE V.	A	2 1/2"			
	B	1 1/2"			
	C	7/32"			
	D	2 1/2"			
	E	13 1/2"			

A.R.A. CLASS		No.2.	No.2+	No.15.	No.3.
DEFLECTION LOAD		12000	15000	15000	18000
TABLE VI.	A	3"	3"		3"
	B	1 11/16"	1 11/16"		1 11/16"
	C	3/8"	3/8"		1/2"
	D	1 1/8"	1 1/8"		1 1/4"
	E	14 1/16"	14 3/16"		15 1/16"
	F	5/16"	5/16"		3/8"
TABLE VII.	A	2 3/4"	2 3/4"		3 1/2"
	B	2 3/4"	2 3/4"		3 1/2"
	C	3/8"	3/8"		1/2"
	D	1 1/8"	1 1/4"		1 3/8"
	E	13 1/8"	15"		15 1/8"
TABLE VIII.	A	2 3/4"	2 3/4"		3 1/2"
	B	2 3/4"	2 3/4"		3 1/2"
	C	3/8"	3/8"		1/2"
	D	2"	2"		2 1/2"
	E	17"	17"		17 1/4"
	F	2"	2"		2 1/2"
	G	5/16"	5/16"		3/8"
TABLE IX.	A	2 1/8"			
	B	2 1/8"			
	C	9/32"			
	D	1 1/8"			
	E	15"			
TABLE X.	A	2 1/2"	2 1/2"		2 1/2"
	B	2 1/2"	2 1/2"		2 1/2"
	C	3/16"	3/16"		3/16"
	D	1 1/8"	1 1/4"		1 3/8"
	E	13 1/2"	15"		15"
	F	5/16"	5/16"		5/16"

Table proposed for Rule 101

cars in interchange it also seems opportune to remove all references to the No. 1 beam from the table of minimum dimensions and include in its stead suitable dimensions to cover the A. R. A. standard No. 15 brake beam if and when this beam becomes standard. Therefore we recommend that the table attached hereto be substituted for that shown on page 154 and that Fig. 2 shown on page 155 be removed.

We further recommend that the present Interchange Rules be amended to cover the following items if and when the No. 15 brake beam and parts become standard:

a—To protect car owners against foreign roads applying present standard brake beams to new cars and cars rebuilt after a special date equipped with the No. 15 brake beam.

b—To provide for the present standard No. 2 and No. 2-plus brake beams to be used to replace in kind or in substitution for brake beams of less capacity until existing stocks of such beams and their parts are exhausted.

c—To provide for the use of the standard No. 15 brake beam to replace any capacity brake beam below the No. 3 brake beam.

d—To provide for new cars and rebuilt cars after a specified date to be equipped with the A. R. A. standard No. 15 brake beam.

e—To provide for the compulsory application of the A. R. A. Standard No. 15 brake beam after a specified date, which would be sufficiently in the future to permit existing stocks to be used up.

f—To provide for the acceptance and equal charge for approved alternate brake shoes.

g—To provide a charge covering the improved standard brake shoe key and approved alternate keys.

Recommendations a, b, c, d, and e, are addressed to the Arbitration Committee, and recommendations f, and g, to the Committee on Prices.

It is also our opinion that the price allowed for a second-hand beam is too high and should be adjusted commensurate with the value of the average second-hand beam.

The report was signed by G. H. Wood (chairman), supervisor air brakes, Atchison, Topeka & Santa Fe; B. P. Flory, superintendent motive power, New York, Ontario & Western; T. L. Burton, air-brake engineer, New York Central; M. Purcell, general air-brake inspector, Northern Pacific; W. H. Clegg, chief inspector air-brake and car-heating equipment, Canadian National; W. J. O'Neill, general mechanical superintendent, Denver & Rio Grande Western; M. A. Kinney, general master mechanic, Chesapeake & Ohio; H. A. Clark general air-brake inspector, Minneapolis, St. Paul & Sault Ste Marie; R. C. Burns, general foreman, Pennsylvania, and L. S. Ayer, general air-brake inspector, Southern Pacific.

Action.—In presenting the report Chairman Wood stated that a member road had requested that consideration be given to increasing the cleaning period for passenger-car brakes to 15 months, the same as has been done in the case of freight brakes. He stated further that this suggestion had just been received, but that the committee would give it prompt consideration so as to submit their recommendation in time to be included in the letter ballot circular. In connection with the recommendations pertaining to the adoption of the No. 15 brake beam it was decided to confine the recommendations for the mandatory application of these beams as approved to new cars and to eliminate the words "and cars rebuilt" in recommendations *a* and *b* in the appendix and to eliminate recommendation *e* of the appendix entirely.

With these changes the report of the committee was approved and submitted to letter ballot.

Report on Car Construction

Standard Box Car—A number of questions involving details of design have been considered and disposed of by the committee and the builder, the Pressed Steel Car Company of the A. R. C. I., was given complete engineering information as of April 14, 1933, necessary to proceed with the construction of the five sample steel-sheathed wood-lined box cars of the design illustrated in Appendix A, Circular DV-768. This design was submitted to the Mechanical Division during the annual meeting held in June, 1932, and was subsequently adopted as standard by letter ballot.

All five cars are to be built to the base design, that is, with the proprietary doors, ends and roofs, after which the committee plans to conduct certain static and impact tests as a check on the design. When this work is completed, it is desired to have the cars placed in regular operation on a number of member roads under both regular and special conditions in order to obtain additional performance data in actual service.

Self-Clearing Hopper Cars—In accordance with instructions, the committee, in co-operation with the A. R. C. I., is proceeding with the design of a 70-ton nominal capacity self-clearing hopper car, in accordance with the program as set forth in Appendix A, Circular DV-768. Although not specifically included in the instructions, a design for a 50-ton nominal capacity hopper car is being produced at the same time. As soon as this work is completed, it is proposed to undertake that part of our present assignment which pertains to a 100-ton self-clearing hopper car.

Refrigerator Car—Work on this design is being held in abeyance until after the standard steel-sheathed box cars are built and tested and the hopper-car assignment is disposed of.

Patents—Subsequent to the 1932 annual meeting, complete drawings and specifications for the new standard steel-sheathed wood-lined box car were submitted to both the Eastern and Western Railroad Associations for complete investigation of the patent situation. During the current year reports from both Associations have been received and analyzed and all questions involving patents, exclusive of those covering proprietary specialties which are purchased from the owners of the patents or their licensees, have been satisfactorily disposed of. Therefore no infringements of existing valid patents or payments of royalties are involved.

Equipment Clearances of Proposed Standard Cars—Recent advice has been received through the secretary that the Engineering Division is making progress on the equipment-clearance investigation. It is hoped that during the coming year definite advice may be obtained and decision reached as to what, if any enlargement in the present clearance diagram, Plate B, Supplement to the A. R. A. Manual, will result.

Truck Springs—In accordance with instructions, an investigation has been made of the various devices, spring groups and complete trucks intended to minimize harmonic spring action for the protection of lading and to reduce at least to some extent, the dynamic forces of operation set up within car structures and trucks. A special sub-committee was appointed to formulate a proposed program of laboratory and road tests intended to develop the facts. This report has now been completed and approved by the Car Construction Committee and released to the secretary for submission to the General Committee for consideration and further advice.

Helical Spring Group for 100-Ton Nominal Capacity Trucks—The sub-committee has submitted a tentative design. This is being reviewed and should be in shape to submit next year.

Truck Spring Planks—A number of reports have been received of freight truck spring-plank failures. The committee is not in position at this time to provide definite advice as to the causes of these failures or to submit recommendations as to how they might be overcome but the matter will be investigated as conditions permit with a view to recommending any design changes which may be considered advisable.

Rail-Motor-Car Axles—During the latter part of the year 1929, the Car Construction Committee initiated a study in co-operation with the A. E. R. E. A. for the purpose of working out standard axles for automotive rolling stock, particularly the larger size axles. This was necessary because the then existing A. E. R. E. A. standard axle designs were inadequate to meet the requirements.

At that time the A. E. R. E. A. was considering the adoption of motor axles having 6-in. by 11-in., 6½-in. by 12-in. and 7-in. by 13-in. journals. On that occasion the sub-committee conferred with the Rolling Stock Committee No. 1 of the A. E. R. E. A., at New York City (December 11, 1929), at which time it was agreed that the A. E. R. E. A. sub-committee would prepare complete calculations for the E-11 and E-12 axles, for submission at an adjourned meeting of these two sub-committees. The E-13 axle was temporarily eliminated from consideration at that time.

It was agreed that the calculations would follow the method laid down by the Master Car Builders Association in 1896 and modified by the A. R. A. in 1920, with proper allowances for motor weight, torque, etc., as well as the diameter of wheels to be on the axles. Calculations were presented at a joint meeting held at Atlantic City on September 28, 1931, but were not in accordance with the above suggestions.

After a thorough discussion of these calculations, it was agreed that the A. E. R. E. A. committee would revise their calculations in line with suggestions made, and again present them for check by the sub-committee.

Correspondence develops that for various reasons, these calculations have not yet been completed; but we have the assurance, through G. C. Hecker, general secretary of the American Transit Association (until recently the A. E. R. E. A.) of full co-operation from that organization and we hope that their investigation will be brought to a satisfactory conclusion to the end that the subject may be disposed of during the coming year.

Brake Beams and Brake Heads—In accordance with action taken during the annual meeting of 1931, the Committee on Brakes and the Car Construction Committee, in co-operation with

the brake-beam manufacturers, have produced a new design of brake beam assembly. Complete information thereon will be included in this year's report of the Committee on Brakes and Brake Equipment. Arrangements have been made to apply this new beam, designated as No. 15, to the five sample A. R. A. steel-sheathed box cars now under construction. A new brake shoe was also developed in connection with the beam but it is the desire of both committees to hold this over another year for further study.

Standard Center Plate—In 1903 a standard center plate contour was adopted for use under 80,000- and 100,000-lb. capacity freight cars. This center plate had a nominal diameter of 12 in. and, although various modifications have since been made, diameter and bearing area of the present A. R. A. standard center plate as shown in the Manual for 2-C, 2-D and 2-E trucks are essentially the same as in 1903. With the progressive increase in carrying capacity and in the number of cars in service of the higher capacities, question has logically been raised as to whether some action should not be taken to increase the diameter of center plates for cars of 140,000 lb. nominal capacity with a view to reducing the bearing pressure, it being claimed that this should result in reduction in the resistance of the trucks to swiveling and less wear on wheel flanges and other truck parts.

There are a number of phases to this proposition which require careful consideration, for example, the fact that increase in the center plate diameter beyond a certain point would normally tend to retard rather than facilitate the swiveling action of the truck. A questionnaire has therefore been circulated to the voting members requesting their comments and data covering their experience.

Box-Car Door Fixtures—Drawings and specifications now included in the Manual, in some cases cover obsolete designs and a sub-committee has been appointed to review the matter with a view to eliminating from the standards all obsolete and unsatisfactory items and setting up fundamental requirements for box-car side-doors and fixtures.

Geared Hand Brakes—At the present time there are available several different types of geared or "power" hand brakes and applications of the various types have been made, in some instances quite extensively, by A. R. A. member roads. Although all of these brakes are similar in certain respects, each brake has its own special features and operating characteristics requiring, in some cases, special knowledge of the brake for proper operation during application or release. With the increasing use of such brakes, especially on freight equipment cars, the desirability of standardizing the basic features of design, application and operation with a view to bringing about uniform practice, is obvious.

A sub-committee has been appointed to make an investigation and submit recommendations. The matter will then be pursued to a conclusion with both the Brake and Safety Appliance Committees with a view, if found practicable, to setting up fundamental specifications to control the features which should be standardized.

Specifications for Steel Castings—During the past year your committee was requested to review the Specification Committee's proposed revision of A. R. A. specification for carbon-steel castings. The revision as originally submitted was not approved but as the result of subsequent co-operation between the two committees, a specification was later approved under which castings of materially improved physical properties may be obtained commercially. This represents a step in the direction of obtaining the benefits of the improved state of the art in terms of longer life, reduced weight, or both.

Reduction in weight of both cars and locomotives is becoming an increasingly important factor in equipment design. Better quality of materials will not automatically and immediately result in weight reduction but since the designer is limited by the physical properties of the materials available, the first step necessary is to improve these properties, especially when this can be done at no increase in cost to the railroads.

The revised specifications are included in the report on Specifications for Materials.

Alloy Steels in Car Construction—Numerous alloys of steel and other materials intended to increase strength, reduce weight and prolong the life of railroad equipment, are being developed and currently submitted for consideration. This is a broad subject and studies relating thereto naturally cannot be confined to any one material. However, the committee realizes the importance of this subject and intends to make a careful study of it as conditions permit.

A number of factors are involved; first, the suitability of the material for the purpose intended must be established; then it is necessary to determine if the increased cost involved, not only for the material itself, but probably for its fabrication and use, may be offset by other savings such as reduction in weight and longer life, to an extent justifying the added cost. It is proposed to conduct this study in co-operation with the Design Committee of the A. R. C. I.

Passenger-Car Designs—A few months ago the committee received a communication from the passenger traffic manager of a member road, suggesting that the Mechanical Division undertake research and experimentation leading to the production of a better type of coach. The action of the American Electric Railroad Association in appointing a research engineer and staff to undertake scientific laboratory investigations preliminary to the subsequent production of a lighter, speedier and less noisy street car, was cited as an example of what might or should be done.

Although only very general knowledge of this undertaking is in the possession of the Committee, it is known that an appropriation of several hundred thousand dollars was made to cover only this preliminary laboratory work. The actual design and construction of the car, if produced, must be undertaken later by a qualified organization of designing engineers.

As a matter of record and for further subsequent consideration and advice from the General Committee, the committee submitted the following comments on this subject:

"It is our belief that during the next few years the greater part of expenditures made on passenger equipment will be devoted to changing and improving existing units with respect to fittings, furnishings, interior arrangements, improved ventilation, air-conditioning installations and similar items rather than on the construction of new equipment.

"Furthermore, it is questionable whether the standardization of passenger cars would be desirable or profitable when considering the many operating territories and service conditions to be met in different localities. Diversity of equipment and facilities are, in our opinion, features of passenger equipment which should be maintained, especially with a view to making such equipment more attractive in comparison with highway and other forms of transportation.

"Individual features such as those mentioned above and others perhaps might profitably be made the subject of research providing the Association is in position to make appropriations for such work but it is not believed that this is a subject which may properly be disposed of as a regular design standardization job to be handled by the Car Construction Committee. In due course your committee will request further advice and instructions on this subject."

Platform Safety Chains for Passenger Cars—The question of elimination of platform safety chains from passenger-train cars has again been raised. A number of member roads have discontinued the use of platform safety chains and have advised the Pullman Company that safety chains are not required on cars operating over their lines, resulting in request from the Pullman Company as to the practicability of adopting a uniform practice.

In view of existing differences of opinion and variations in practices on member roads, and inasmuch as this is essentially an operating matter, the subject has been referred to the General Committee for investigation and decision through operating channels or as it may be decided to handle.

Letter Ballot Items

It is recommended that the following items relating to definitions and designating letters for freight cars be submitted to letter ballot:

Proposed Change—"BM"—Milk Car. A non-insulated car without means of refrigeration, constructed and equipped for passenger-train service. Primarily for the transportation of milk in cans.

Proposed Change—"BMT"—Milk Car. An insulated car with one or more large tanks and without means of refrigeration. Constructed and equipped for passenger-train service and used primarily for the transportation of pre-cooled milk.

Proposed New Form—"BMR"—Milk Car. An insulated car having ice bunkers or ice boxes, and constructed and equipped for passenger train service. Primarily for the transportation of milk in cans.

Proposed New Form—"XAR"—Automobile. Similar in design to general service box car, but with exceptionally large side or side and end doors and equipped with permanent automobile stowing equipment.

The report was signed by P. W. Kiefer (chairman), chief engineer motive power and rolling stock, New York Central; W. A. Newman, chief mechanical engineer, Canadian Pacific; A. H. Fetters, general mechanical engineer, Union Pacific System; C. L. Meister, mechanical engineer, Atlantic Coast Line; J. McMullen, superintendent car department, Erie; F. A. Isaacson, engineer car construction, Atchison, Topeka & Santa Fe; W. O. Moody, mechanical engineer, Illinois Central; C. B. Smith, engineer of tests, Boston & Maine; S. O. Taylor, master car builder, Missouri Pacific; G. S. Goodwin, assistant to general superintendent motive power, Chicago, Rock Island & Pacific; J. J. Tatum, general superintendent car department, Baltimore & Ohio; E. B. Dailey, engineer car construction, Southern Pacific; B. S. Brown, assistant engineer, Pennsylvania; T. P. Irving, engineer car construction, Chesapeake & Ohio; K. F. Nystom,

superintendent car department, Chicago, Milwaukee, St. Paul & Pacific, and J. P. Laux, superintendent motive power, Lehigh Valley.

Action.—The report was approved and submitted to letter ballot.

The recommendations of the committee designating letters and definitions for milk cars had already been referred to letter ballot vote of the members. The General Committee was advised by the secretary that these recommendations had been approved with only one dissenting vote. The secretary was instructed to issue a circular announcing the result of this letter ballot.

Report on Couplers And Draft Gears

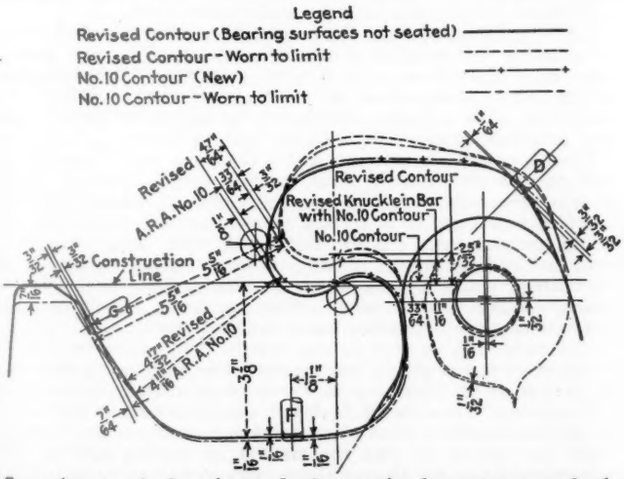
Draft Gears

Approval Tests of Draft Gears for Freight Cars—A total of 11 applications for approval tests of draft gears have been received from six manufacturers to date. Ten complete or partial tests have been made at the A. R. A. Draft Gear Laboratory at Purdue University under the immediate supervision of A. R. A. Draft Gear Engineer W. E. Gray and, as result of these ten tests, certificates of approval have been granted covering the following types of gears for freight service: Waugh-Gould Type 403; National Type M-17-A; Cardwell-Westinghouse Type NY-11-E; Miner Type A-22-XB, Cylinder No. D-7935; Miner Type A-2-XB, Cylinder No. D-7940; Cardwell Type L-25-SA.

Specifications—The subcommittee recommends the insertion of a new paragraph under the heading of "Tests Set-up and Definitions" in the Standard Specifications for Approved Draft Gears for Freight Service, to read as follows:

"7 (d). If, in the judgment of the test engineer, the operation of a gear is influenced either favorably or unfavorably by an accumulation of worn off particles of metal within the gear, it may be dropped to a horizontal position occasionally in order to give these particles the same opportunity to escape that they would have if the gear was in service. However, no artificial method of cleaning by means of blowing or otherwise will be permitted."

It is not considered necessary to submit the above recommendation to letter ballot as it is merely descriptive of the test procedure now being followed in the official tests. The insertion of this new paragraph will make it necessary to re-


Legend
Revised Contour (Bearing surfaces not seated)
Revised Contour - Worn to limit
No. 10 Contour (New)
No. 10 Contour - Worn to limit
Revised A.R.A. No. 10
Revised Contour
Revised Knuckle in Bar with No. 10 Contour
No. 10 Contour
Construction Line
Revised A.R.A. No. 10

Superimposed drawing of the revised contour and the standard No. 10 contour for comparison—new and worn conditions

number existing paragraphs 7 (d) to 7 (i), inclusive, to read 7 (e) to 7 (j), respectively.

Road Tests—The subcommittee renewed its recommendation of last year and the year before with respect to road tests. It was recommended that such tests be undertaken as soon as business conditions permit for the purpose of ascertaining the effect of draft-gear recoil of various intensities in long trains and, also, to investigate Duryea and Alma cushion underframes and draft gears of the selective-travel type. It has been necessary to defer these tests for reasons of economy.

Substitution of Different Makes of Friction Draft Gears in Repairs—A suggestion has been considered by the Committee that a foreign road in repairing cars of other ownerships be allowed to substitute without penalty any of the friction draft gears meeting the A. R. A. Specifications. It is recommended that the Arbitration Committee prepare a rule providing that where friction draft gears are interchangeable as far as space, attachments and travel is concerned, permission be given to substitute approved gears for old gears and for each other. The proper method of identifying approved gears is by the letters "A. R. A." with the year date of the specifications stamped or cast on the casing or housing.

Reclamation of Couplers, Knuckles and Locks

The Type E knuckle has been changed to provide more wearing material on the pulling surface of the knuckle. This was accomplished by shifting the lightening core ⅛ in. forward and thus obtain ⅛ in. additional wear. This change in the wear limit requires a corresponding change in the knuckle wear and stretch gage, No. 24992, which was designed for use on the Type D and Type E knuckles according to their original designs.

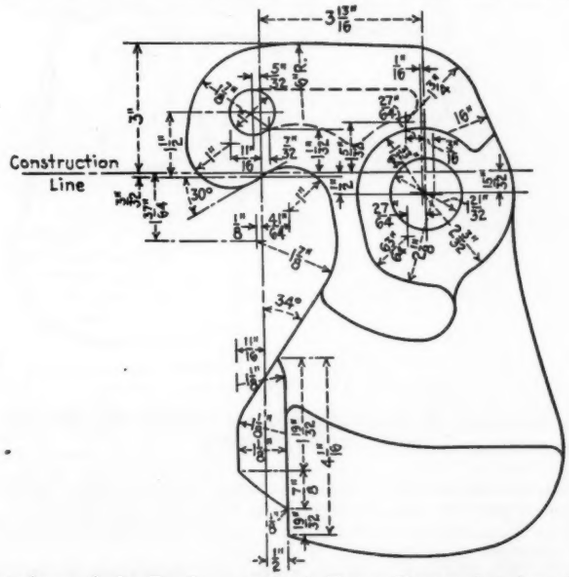
In response to an inquiry sent to the membership as to the processes being followed in reclaiming knuckles, 65 roads have made reply, from which the following summary was compiled:

Employing process

No. 1	6 roads
No. 2	10 roads
No. 3	24 roads
No. 4	2 roads
Nos. 3 and 4	2 roads
Roads not reclaiming knuckles	*21

* These are mostly small roads.

There has been called to the attention of the committee instances where roads reclaiming knuckles are not using the pre-



Drawing of A. R. A. standard Type E coupler knuckle showing revised contour

scribed A. R. A. gages in this work and, as a consequence, are placing in service knuckles that are inoperative when applied to certain bars. This is a very serious matter and one that should not be tolerated on any railroad.

In referring to the reclamation of coupler bars, the committee, in last year's report, recommended that coupler bars with cracks in the knuckle side wall not exceeding 2½ in. in length, or 3/32 in. opening, should be acceptable in interchange. Also, a boundary was established in Fig. 23 showing the area within which cracks in this knuckle side wall might be welded. These recommendations of the committee were adopted, but experience in their application, together with further research on the part of the committee in regard to this particular type of coupler-bar failure, has resulted in the committee recommending a change in the rule extending the limits within which couplers cracked in the knuckle side wall would be acceptable in interchange. It is suggested that Rule No. 18 as it refers to cracks in the knuckle side wall be revised as follows:

Proposed Form—Coupler bodies, types D and E, with cracks in knuckle side wall back of knuckle tail shall not be removed from foreign cars unless—

(a) Such crack is over 6½ in. in length located within an area 3 in. above and 3 in. below the horizontal center line of knuckle side wall or any crack that extends beyond the above mentioned area, or,

(b) Section is broken out within this prescribed area whose greatest dimension exceeds 3 in.

The committee recommends that paragraph A-5, shown at

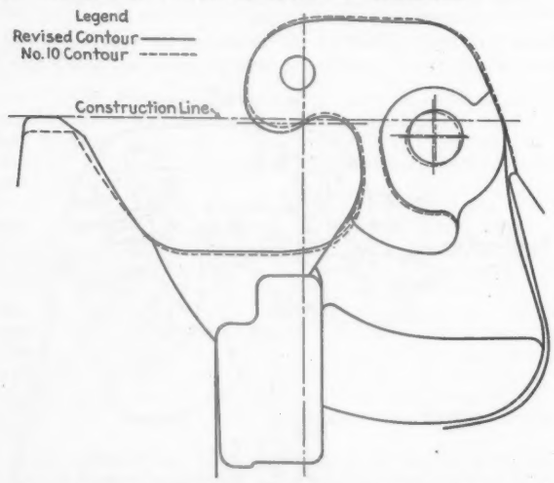
the top of page 16, Circular No. D.V.-761, be revised to read as follows:

"A-5. Reclaimed knuckles are not to be considered acceptable if when applied to a normal *new* bar the gaging distance between the surface of the guard arm and the nose of the knuckle is in excess of 4⅞ in. measured perpendicular to the guard arm surface."

Elimination of Cross Key From Swivel-Butt Coupler—The subject of elimination of the cross key from swivel-butt coupler as an alternate standard was discussed at considerable length in the 1932 report of the committee. This subject has been given further consideration during the past year in co-operation with the Committee on Car Construction. After careful consideration, it has been decided that no further consideration will be given to the elimination of the cross key from swivel-butt coupler as it is considered essential to the proper alignment of the coupler and yoke, as pointed out in the report of the committee last year.

Revision of Standard Coupler Contour

The annual report of the committee for the year 1932 advised that the coupler manufacturers were considering a re-design of the present contour lines of the standard "E" coupler to improve its operation and service. This development has been completed and definite recommendations are submitted.



Standard E coupler contours, revised and No. 10, superimposed

Improvements—The revised contour assures many additional improvements in the standard Type E coupler, as follows:

(1) The addition of 1/16 in. of metal to the front face increases its strength approximately 5 per cent.

(2) The revised contour worn-limit allowance is increased 1 1/64 in. or approximately 40 per cent.

(3) The revised Type E knuckle used in Type D coupler heads will increase the contour worn limit allowance 5/64 in. or approximately 24 per cent.

(4) The revised contour provides an increased factor of safety when the coupler has reached the worn limit.

(5) The revised Type E knuckle applied to Type D coupler heads will maintain the present factor of safety when contour reaches the worn limit.

(6) Relocation of the knuckle-pin hole and the addition of 1/32 in. to inside of knuckle hub will increase the tension section of the knuckle hub 3/32 in.

(7) Relocation of the knuckle-pin hole and readjusting of pulling lugs and knuckle-pin protectors will reduce the rate of development of wear and coupler slack.

(8) The revised contour improves the pulling face of the knuckle by increasing the hook effect.

(9) The improved design at the end of the guard arm increases the coupler gathering range from 3 in. to 3½ in. total, approximately 15 per cent.

(10) Contact surface between knuckle and bar is increased when couplers are in buffed position.

Construction Drawings—The improvements to the standard contour and standard Type E coupler were detailed in drawings included in the report.

Standard Gage Changes—The correct manufacture and fitting of the standard Type E coupler and parts, with the revised contour, will require changes to several of the present standard Type E coupler gages and masters. These changes were shown on drawings included with the report.

Increased Weight—The improvements will add approximately two pounds to the present weight of the standard Type E knuckle, and approximately four pounds to the present weight of the coupler head, a total approximate increase of six pounds to the complete coupler. This increased weight is a decidedly small item in comparison with the advantages gained.

Recommendations—The following recommendations were submitted for consideration:

1. That the revised contour be approved as standard and be designated A. R. A. Standard No. 10-A Contour.

2. That the relocation of the knuckle pivot-pin hole and the addition to the pulling surface of the pin protectors be approved as standard.

3. That the change in radii of pulling lugs and pin protectors be approved as standard.

4. That the changes to A. R. A. standard E coupler gages be approved as standard.

5. That the coupler manufacturers be authorized to scrap their patterns, core boxes, and gages covering the D coupler bodies.

It is pointed out that the condemning limit for D and E couplers shown on Fig. A, page 44 of the Interchange Rules, applies to the new contour.

The report was signed by R. L. Kleine (chairman), assistant chief motive power, Pennsylvania; H. W. Coddington, engineer of tests, Norfolk & Western; C. P. VanGundy, engineer of tests, Baltimore & Ohio; C. J. Scudder, superintendent motive power and equipment, Delaware, Lackawanna & Western; S. Lynn, superintendent rolling stock, Pittsburgh & Lake Erie; L. P. Michael, chief mechanical engineer, Chicago & North Western, and C. T. Ripley, chief mechanical engineer, Atchison, Topeka & Santa Fe.

Action.—The report was approved and submitted to letter ballot.

Report on Loading Rules

The committee has long realized that it would be beneficial to simplify the Loading Rules, but carrying out the various suggestions received could not be done without enlarging the book of rules, which was deemed undesirable by reason of it already being too large and the printing, etc., being too expensive.

After conferring with many shippers and railway employees the committee unanimously agreed that it would be to the best interest of all to reduce the size of the book, and at the same time make the regulations more easily understood.

With that in mind the general rules have been reworded, thereby reducing the wording about 50 per cent. The new general rules have been grouped in sections so that, with the exception of the rather complicated tables, it should not be difficult for employees with ordinary intelligence to memorize them, which was practically impossible with the former rules.

The many cross references in the old rules made it a difficult task to determine exactly what was required. In other words, it was, generally speaking, necessary first to study the rule or rules pertaining to a certain figure, then the figure, as well as the general rules. While this could, with care, be properly done at loading points, it was, in most cases, impossible at interchange points by reason of insufficient time being allowed, which, no doubt, to no small extent, accounts for the policing in interchange so frequently being unsatisfactory.

The rules will, as near as can now be determined, be reduced to not more and probably less than ten, the latter being necessary by reason of it being impossible to cover certain commodities with figures. To accomplish this it was necessary to extract all of the specifications from these rules and condense them underneath the figures, so that the method of loading can be fully determined from the figures alone, without having to bear other than the four general rules in mind.

All the figures have been revised accordingly, and a uniform method of setting them up has been adopted, which will be strictly adhered to in connection with new regulations. The outlines of the material used for securing the lading have been made heavier than the outlines of the car, etc., which it was thought would make for more rapid analization.

The sub-committee is now planning to have the new book made up in the following consecutive order:

(A)—Index to the rules and figures.

(B)—The General Rules.

(C)—The rules which could not be covered with figures.

(D)—The figures.

While exacting care has been exercised to avoid deviations from the original intent or requirements of the rules or figures, it is quite possible that mistakes will be found, which, however, will be promptly corrected upon request. The work is far from being completed, but strenuous efforts will be made to place

it in the Secretary's hands in time for publication on or before January 1, 1934, provided, of course, these explanations justify its approval at this time.

Interchange Rule 36, now appearing in Supplement No. 1, effective January 1, 1932, will appear on page 1, of the new Book of Rules in the following condensed form:

ATTENTION SHIPPERS

ADVERTISEMENTS, ROUTING CARDS, COMMODITY CARDS, SPECIAL PLACARDS, CERTIFICATES, ETC.

RULE.....ROUTING CARDS.—See Fig. A.—(a) Permitted on all loaded cars, provided they are of cardboard, of dimensions not exceeding 5 in. by 8 in. without picture or trade mark, with railroad information confined to lower three fifths, with letters printed on upper two fifths not exceeding ½ in. in dimension, with all printing in black ink and without red background. Shippers may attach not to exceed one card to each side of car, but they must not be pasted or glued.

(Name of Consignor, etc.)

(Name of Consignor, etc., in letters not more than one-half inch in any dimension).

.....

Initial and No.....Contents.....

Point of Shipment.....R. R.

Consignee and Destination.....

Via .....

Date .....

Fig. A—Routing Card

(b) *Commodity Cards*—Cardboard, of dimensions not over 12 in. by 12 in., without picture or trade mark, without printing in red or red background, and with printing limited to such as "Handle Carefully", "Fragile", "Unload from this Side", etc. Shippers may attach not to exceed one card to each side and one to each end of a car. They may be placed in racks, but must not be pasted or glued. They may be secured to tank cars as desired.

(c) *Special Placards*—They shall be such as are required by the "Interstate Commerce Commission Regulations for Transportation by Rail of Explosives and Other Dangerous Articles by Freight". They shall be used, be of the text and be attached to cars as prescribed by said regulations. All such cards, except Special Dome Placards and the optional "Dangerous-Empty" placards as per paragraph 245 and 709 of the Interstate Commerce Commission regulations must be removed from empty cars.

Placards required by the federal or state governments-customs regulations card, printed on red cardboard 8 in. by 10½ in. in size, which specifies the penalty for the unlawful removal of the United States Custom seals, must be used as prescribed by the United States Customs Regulations.

(d) *Advertisements—Banners—Placards*—Attaching temporary advertisements to cars in any manner is prohibited, except when applied to the lading, or to temporary stakes necessary to secure the lading. Applying them to permanent stakes which are a part of the car, or temporary stakes provided solely for the purpose of carrying them, or to full train load of cars for special advertising purposes is not permissible.

The following clause has been added to the General Rules:

Steel sliding plates shall be at least ¼ in. by 6 in. and project beyond each side of lading a distance equal to the figures shown in last column of tables under Rule 4, for the respective loads. Must be well greased before loading and at interchange points, when necessary. Heads of bolts, etc., used for securing plate to sliding piece must be flush with or below the sliding surface of plate.

The following has been added to Rule 1, Section (L), paragraph 2:

Rods or bolts with rolled threads with same diameter as that of U. S. standard cut threads may be used.

The strength at bolt holes in flat bars or bands must be equal to their specified tensile strength.

The substitution of high tension bands or high tension wires or rods, bolts or bands with threaded ends is permitted only when specified. When used they must be cold worked and have a percentage elongation in 6 in. from 5 to 16 per cent, inclusive. Protect bands, stake pockets, etc., with metal fillers to provide radius of at least ½ in.; also protect points of contact with sharp edges. Tighten each wire or band to at least 60 per cent of its tensile strength. Twist tie ends of wire, and seal or weld ends of each band, the strength of each to be at least 85 per cent of the strength of bands or wire.

Reason: To avoid repeating in each rule or figure where the use of high tension bands or wires are specified.

Upon authority of the General Committee and approval of the Board of Directors of the American Railway Association, the rules governing the loading of commodities in closed cars, formerly shown in the Mechanical Division Loading Rules, have been eliminated, which, in the future, will be included in the rules covering closed car loading issued by the Transportation Division.

Group I—Lumber, Logs, Ties, Etc.

RULE 132

To economize for shippers, Fig. 23, has been revised to provide for the elimination of one pair of stakes at overhanging end when the overhang consists of only one layer, or when only one row is loaded one above the other at center of load.

Group II—Loading of Structural Materials, Wheels, Pipe, Etc.

RULE 201-A

To economize for shippers, figure 44-E has been changed to permit the elimination of blocking between load and stakes, item B; also to permit spacing of clamps, items G and H, not more than 7 ft. apart, provided end blocking, items C, D, E and F are used.

RULE 220

By request of shippers the first sentence has been changed to read:

If necessary, place bearing piece with ¼ in. by 6 in. sliding plate on adjacent car to prevent contact of overhang with its end or end gate.

RULE 223

To economize for shippers and to improve loading, figures 58, 59 and 60 have been consolidated into a new figure, in order to reduce the width of bearing pieces from 12 in. to 10 in. for loads weighing 72,000 lb. or less. Dimensions of strut angles have been reduced from 6 in. by 6 in. to 4 in. by 3 in., and only one will be used at end instead of one at each side. A new figure, 60-A, provides for the reduction in the width of bearing pieces used under angles, channels, etc., from 12 in. to 10 in.

RULE 230

To economize for shippers the thickness of sliding plates used in connection with the loading of flexible material has been reduced from ½ in. to ¼ in. and sketch "A", page 177, of the old rules has been eliminated.

RULE 240-B

In order to prevent damage to equipment and to provide better distribution, this rule has been changed to permit the loading of axles, etc., crosswise. The old rule made it mandatory to load lengthwise.

RULE 261

By request of shippers and to reduce cost of unloading an additional sentence has been added to read:

Such loading in self-clearing hopper cars must be confined to borings, turnings, loose tin and sheet steel cuttings.

To economize for shippers, dimensions of stakes have been reduced from 4 in. by 5 in. to 4 in. by 4 in.

To accommodate shippers, the committee recommends that in cases where it is necessary to place cleats, etc., underneath car floors for bolts, rods or bands with threaded ends, the following substitutions be allowed:

⅜ in. by 4 in. by 6 in. metal strap, versus 2 in. by 4 in. by 18 in. wooden blocks.

½ in. by 4 in. by 6 in. metal, versus wooden blocks of larger dimensions.

By request of shippers, three attached new figures 1, 2 and 3 (numbers to be assigned) have been provided to cover the loading of steel wire mesh and bar mats.

RULE 252

To improve loading of cast iron pipe, attached figures 82, 82-A, 82-B, 83, 83-A, 83-B and 83-C, have been revised.

Group III—Machinery, Engines, Etc.

RULE 302

To economize for shippers, figure 99, has been changed to provide that the two wedge shaped end blocks, items E, may be eliminated when each end block, item D, is secured with 2⅝ inch bolts, instead of with nails, and new paragraph has been added to read:

For steel floors block out between load and car sides and ends to prevent shifting, or secure items C and D to floor with bolts.

The figure has also been clarified to indicate that items D and E must be applied to both ends of tank when loaded end to end.

To economize for shippers figure 100, has been changed to provide for the elimination of end blocking, items G, H, J and K, when their lading is tied down with rods or bands with threaded ends. These items, however, must be used in connection with high tension bands. The use of wire has been prohibited by reason of not being suitable for this kind of lading.

By request of shippers, figure 100-A-1, has been provided to cover the loading of large tanks one above the other.

A new paragraph has been added to figure 101 to read:

For steel floors block out between load and car sides and ends to prevent shifting, or secure items C and D to floor with bolts.

The use of wire has been prohibited by reason of not being suitable for this kind of lading.

RULE 302-A

The use of wire has been prohibited by reason of not being suitable for this kind of lading.

By request of shippers, attached new figure 101-H and 101-I have been provided to cover the loading of heating and locomotive type boilers.

RULES 306

To economize for shippers the following changes have been made in figure 103-A:

Item 8, Eliminated.

Item 9, Reduced from 6 in. by 6 in. to 2 in. by 6 in.

Item 16, Reduced from 6 in. by 6 in. by 24 in. to 3 in. by 6 in. by 24 in.

Item 19, Reduced from 6 in. by 6 in. to 3 in. by 6 in.

For the same reasons the following changes were made in Fig. 103-C:

Item 18, Reduced from 4 in. by 6 in. to 2 in. by 6 in.

Item 19, Eliminated.

By request of shippers, three attached new figures A, B and C (numbers to be assigned) have been provided to cover the loading of:

(a) Four Wheel Auto Trailers.
(b) Composite Freight Containers.
(c) All Metal Freight Containers.

Group IV—Building Materials, Brick, Stone, Etc.

RULE 405

To prevent breakage a recommendatory clause has been added to figure 112-C to indicate that slabs of stone from 3 in. to 5 in. thick should be loaded on edge, lengthwise of car, when it is possible to do so. Old figure 112-B, has been eliminated by reason of being deemed unnecessary.

RULE 414

To prevent breakage, figure 111, has been changed to provide that stone grindings placed between grindstones and car floor must be sifted.

The report was signed by S. Lynn (chairman), superintendent of rolling stock, Pittsburgh & Lake Erie; E. J. Robertson, superintendent car department, Minneapolis, St. Paul & Sault Ste. Marie; R. H. Dyer, general car inspector, Norfolk & Western; G. R. Lovejoy, master mechanic, Detroit Terminal Railway; T. O. Sechrist, assistant superintendent machinery, Louisville & Nashville; C. J. Nelson, superintendent of interchange, Chicago Car Interchange Bureau; J. A. Deppe, assistant superintendent car department, Chicago, Milwaukee, St. Paul & Pacific; W. B. Moir, chief car inspector, Pennsylvania, and H. S. Keppelman, general car inspector, Reading Company.

Action.—The report was approved and submitted to letter ballot.

Report on Locomotive And Car Lighting

During the past year the members of the Committee have individually kept in touch with the details of locomotive and car lighting, and have at this time no particular items to report for special attention.

The subject of air conditioning of passenger train cars has been particularly watched, in view of the divergent methods and systems of air conditioning being tried. That subject still appears to be very much in the development stage.

In view of the general conditions existing during the past year, no meeting of the committee was called.

Report on Locomotive Construction

The report of the Mechanical Division, Committee on Locomotive Construction, was extensive, being divided into a consideration of 10 subjects and including an equal number of exhibits.

Important recommendations were included regarding the proper method of counterbalancing reciprocating steam locomotives. Specifications for several additional fittings for high-pressure locomotives were suggested for inclusion in the Manual of Recommended Practice. Considerable space was devoted to the advantages and disadvantages of higher boiler pressures, the report including a detailed record of individual railroad experiments with high-pressure power. Reference was also made to the performance of a non-condensing turbine locomotive now undergoing tests in Sweden.

Development and Use of Oil-Electric Locomotives

The subcommittee assigned to this subject reported summaries of the operating costs for 1932 in two tables for 300-hp. oil-electrics and for 600-hp. oil-electrics.

The first table showed ten 300-hp. locomotives operated in railroad service with an average operating cost of $2.35 per hour exclusive of depreciation and fixed charges. If operation with a one-man crew were permitted, this average cost could be reduced to $2.21 per hour. For comparison a corrected figure on this basis was included.

The second table showed a similar average operating cost of $3.05 per hour for four 600-hp. oil-electrics, and $2.48 per hour for one 800-hp. Although covering relatively few operations, it was considered that these operating costs apply under normal conditions. The report continued as follows:

"As various factors govern for most economical operations with oil-electrics, as review of the cost statements indicates, and to offset the higher first cost of this type of locomotive, its service conditions should insure continuity of operation for most favorable results; also that with 300- and 600-hp. units, a one-man engine crew is desirable as contributing further to lower operating costs.

"Depreciation at 4 or 4½ per cent per annum and interest or fixed charges ranging at 4½ to 6 per cent constitute items of such relatively high additional charges on the total operating costs per hour, compared with steam locomotive operations, that even for switching service ranges suitable for 300- to 600-hp. oil-electrics, the steam engine assignment should be as it usually is of the older power 0-6-0, 2-6-0 types, which have depreciated to near salvage value and depreciation costs are nil for the steam engine operation.

"If, however, the service life of steam locomotives has reached a stage where further class repairs do not justify continuance of such depreciated engines in use the replacement can then not be effected by older power units it would require the purchase of new locomotives which, from an availability standpoint, can only give 16-hour maximum service, while the oil-electrics can perform 24 hours per day in comparison. Therefore, the service availability obtained by each oil-electric is equivalent to 1½ steam locomotives, which, on the average-cost-per-hour basis, entails similar depreciation and fixed charges per hour for either steam or oil-electric operation. The comparative charges are entitled to correction on this availability basis and should be so considered.

"Repair-cost items noted on the statements show wide ranges, due to classified repairs occurring in the period covered by the report. These changes should be extended over certain periods of service-hours, as from information on this subject, the oil-electric classified repairs may occur any time between one and three years. Length of service for this type power has not been sufficient to establish conservative cost figures which could apply in all cases or average service-hours between classified repairs. However, variations of cost items in our report for the oil-electric operations cover relative average conditions.

"Enginehouse expense is an accounting charge that includes costs for heating, lighting, water, steam, ash-pit operation, etc., including miscellaneous labor incurred in enginehouses and the total cost distributed per steam locomotive, on a unit locomotive basis, is chargeable to each oil-electric, although it is known that

terminal charges per each oil-electric is less than steam locomotives, and the pro rata rate applied shows higher cost of operation per hour for oil-electric operations than would be actually incurred; yet, it cannot be otherwise as relatively few oil-electrics usually operate along with the greater number of steam locomotives in the same service. Therefore, if switching services are such that the number of cars per movement is within the capacity of the oil-electrics and they can each be operated with one-man crew, with service-hours averaging 20 per day, their use should effect economy of operation in such service.

"Adaptability of these oil-electrics as to clearances, concentrated weights, ease of operation over sharp curves through industrial sidings, frogs and switches, in terminal yards, in quick acceleration short hauls, and absence of smoke, tends to recommend them favorably for switching service, especially if the steam locomotives employed have reached periods of replacement and necessitate purchase of new power where closer economy studies attend their selection."

The proper application of steel tires to the wheel centers of locomotives and tenders was considered in the committee report; also the design and repair of locomotive springs and other details. A method of reporting, analyzing and correcting the failures of detailed parts of locomotives was included; also a discussion of the use of stainless steel and aluminum alloys.

Roller Bearings for Locomotives and Tenders

The committee stated that the adaptability of roller bearings to engine trucks, trailing trucks, driving wheels and tender wheels has been well developed and their value demonstrated in long locomotive runs, which emphasize the demand for maximum reliability and serviceability in modern power. The report showed a total of 432 locomotives equipped with roller-bearing engine trucks, some of which have been in service for six years and have made a total of 400,000 miles. Three other roads reported a program for application of roller bearings to engine trucks of existing power. Regarding this type of installation, the committee said: "Aside from the initial cost of application, it does not appear that there can be any legitimate excuse to order new power without roller bearings at least in the trucks, and it is evident from replies received that the extra cost is entirely justified by better locomotive performance and subsequent economies in operation." The report showed that six locomotives on four railroads have been equipped with roller bearings on the driving axles. Regarding this detail the committee reported: "While the application of roller bearings to locomotive driving axles presents a more difficult problem than the engine truck, the improvements to be gained are even more important and desirable." Referring to trailer axle bearings, the committee stated: "It is common experience, with possibly a few exceptions, that trailer-axle bearings have presented a less difficult problem in operation than engine trucks and driving bearings. However, maintenance and lubrication, inspection, etc., of plain trailer bearings have been a sufficient problem, at least on high-speed power, to justify the use of roller bearings."

The report referred to the experimental application of roller bearings to locomotive main and side rods and other details, closing as follows: "So far as we are aware, the above report covers practically all roller-bearing applications to locomotives and tenders. It can be seen that in four years' time, including three years of adverse conditions, the railways have made considerable progress in developing the use of roller bearings on locomotives and tenders, particularly to engine trucks, trailers and tenders. Several of the roller-bearing manufacturers have devoted much effort in developing special types of roller bearings suitable for locomotive axles, and their work along this line is commendable, especially with reference to their special designs for driving axles. The management of the railroads who have taken the initiative in this new and promising field are likewise to be commended for their progressive efforts. From these efforts, it is believed that sufficient experience has been developed to justify others in taking advantage of the undoubted improvements in locomotive operation that the use of roller bearings makes possible. Without doubt, there will be an increasing number of new locomotives equipped with roller bearings and, by investigation of this, the Committee on Locomotive Construction now has a program for working up certain fundamentals of design with reference to axles, pedestals, boxes, etc., in order that standardization may be established in so far as the subject will permit."

The report was signed by W. I. Cantley (chairman), mechanical engineer, Lehigh Valley; H. H. Lanning, mechanical engineer, Atchison, Topeka & Santa Fe; H. A. Hoke, assistant mechanical engineer, Pennsylvania; G. McCormick, general superintendent motive power, Southern Pacific; W. F. Connal, mechanical engineer, Canadian National; G. H. Emerson, chief motive power and equipment, Baltimore & Ohio; A. H. Fetters, general mechanical engineer, Union Pacific; R. M. Brown, superintendent motive power, New York Central; S. S. Riegel, mechanical engineer, Delaware, Lackawanna & Western; W. G. Black, vice-president, Chesapeake & Ohio, New York, Chicago & St. Louis, and Pere Marquette, and C. Harter, chief mechanical engineer, Missouri Pacific.

Action.—The report was approved and submitted to letter ballot.

Lubrication of Cars And Locomotives

Since the last report of this committee there has been continued improvement in the results obtained from better lubrication practices instituted with the adoption of A. R. A. Rule 66. Notwithstanding the enforced curtailment of operating expenses during the last two years there has been a continued improvement in hot box performances. Mileage records upwards of 800,000 mi. per failure are no longer uncommon in freight service.

These records are being made despite the fact that there are still car owners continuing the practice of stenciling their cars to indicate that work has been properly done although the requirements of the rule have not been attempted.

Numerous cases have been noted where journal bearings were worn below condemning limits, packing waste dirty and in shreds, and oil dirty, yet cars bore stencil to indicate recent repacking.

The use of cheap grades of inferior waste for new journal box packing by some roads continues to be a major cause of waste grabs.

In accord with instructions of the 1931 Convention and because of the continued successful use of All-Year car oil by a number of roads in various parts of the Country, this Committee with the Committee on Specifications prepared a Specification for All-Year service car oil. This specification was published in Circular D.V.-771 dated May 23, 1932, as information for members, as a progress report.

In view of the uniformly successful results from use of All-Year service oils, of which there are now a number of brands on the market of such improved quality over the car oils previously used, it is the opinion of this Committee that a more extended use of All-Year service oil will be of material benefit to all member roads in reduction of hot boxes.

To encourage the use of better grade car oil, it is recommended that present Recommended Practice Specifications for new car oil, summer and winter, shown in A. R. A. Manual, Pages A-339-340, be eliminated and the following specification for All-Year service car oil be incorporated in the A. R. A. Manual as Recommended Practice:

Flash	275 deg. F.. Min.
Saybolt viscosity at 210 deg. F.	Min. 50 sec.
Saybolt viscosity at 100 deg. F.	Max. 320 sec.
Maximum pour point test	Max. 0 deg. F.
Water	Max. 0.10 percent
Tarry Matter	Max. 0.05 percent
Insoluble Impurities (dirt)	Max. 0.10 percent

Any material used for blending, when subjected to a distillation according to A. S. T. M. gas oil method, must show not more than five (5) percent distilling below 500 deg. F.

The methods to be used in determining the above are as follows:

Flash	A. S. T. M. Method	D 92-24
Saybolt viscosity	A. S. T. M. Method	D 88-30
Water	A. S. T. M. Method	D 95-30
Maximum pour point test	A. S. T. M. Method	D 97-30

Test for Tarry Matter and Insoluble Impurities (Dirt)

Before weighing out the individual portions for the tests, hold a portion of the violently shaken sample at a temperature of about 212 deg. F. for two hours and shake frequently during the time. Weigh 5 grams of oil into a 200 to 300 c.c. Erlenmyer flask. Add 100 c.c. of A. S. T. M. Standard precipitation naphtha (A. S. T. M. Method D-91-29T). (If the sample weighed out differs markedly from 5 grams, use 22 c.c. of precipitation naphtha per gram.) Stopper and swirl repeatedly until the oil is dissolved and the solution is homogeneous. Let stand exactly one hour thereafter. Filter on a Gooch crucible, keeping the crucible closely covered to prevent creeping. Wash with more of the same precipitation naphtha.

Next put 25 c.c. of re-distilled chloroform into the flask and dissolve all the tar therein. Pour the solution on the same crucible and receive the filtrate in a weighed 250 c.c. beaker. Continue washing the crucible with the rinsings on the flask and wash further until the crucible is free from tar and the washings run through colorless. Evaporate the chloroform solution to dryness, lay beaker on its side in oven at 212-221 deg. F., dry for one hour, cool and weigh.

To determine miscellaneous dirt in the oil, the first filtration

should be on a weighed Gooch crucible and all of the residue must be brought on to the crucible during the treatment with chloroform. Use a policeman if necessary. The matter insoluble in chloroform is miscellaneous dirt.

Weigh the residue plus crucible after drying at 212-221 deg. F. for one hour. Calculate percentage by weight for both determinations.

Lead soaps will not be considered insoluble impurities.

As instructed by the General Committee, a review of specifications for reclaimed oil, new car oil, new waste for journal box packing, and dust guards was undertaken with the following result:

Specification, Reclaimed Oil, Standard Shown A. R. A. Manual, Page A-86-G-1932.—It was recommended by this Committee that present Par. 7, reading: "Oil must be bright and clean and free from any extraneous solids that will not pass through a number 325 mesh screen," be eliminated from specification. This requirement was felt to be of little value and unnecessary as oil that meets the other requirements of the specification would pass through a 325 mesh screen at a specified temperature, and terms bright and clean as applied to reclaimed car oil are indefinite.

A Sub-Committee was appointed to review this specification with particular reference to present Par. 5. Considerable work has been done but so far no definite recommendations for changes have been arrived at.

Specifications, New Car Oil, Recommended Practice, shown A. R. A. Manual, Pages A-339-1931 and A-340-1931.—It is recommended that present specifications be eliminated and new specifications for All-Year service car oil be adopted as recommended practice.

Specifications, New Waste for Journal Box Packing. Standard A. R. A. Manual, Page A-86-H-1932.—No recommendations for any changes are desirable or necessary at this time.

Specifications, Dust Guards, Standard, A. R. A. Manual, Page A-335-1931.—In order to permit the use of standard mill thickness plies in manufacture of laminated dust guards, this Committee recommends that Par. 6, Tolerances, be changed to read: "The thickness of dust guards is specified in drawings on pages 17 and 18 of Section D as 5/8 in. A tolerance of 1/16 in. under or 1/64 in. over will be permitted."

The above recommendations were referred to the Committee on Specifications for Materials for their attention.

Journal Bearings with Cracked Linings.—The practice of scrapping journal bearings where linings have developed slight hair line cracks was given study during the past year. Tests were run where bearings with cracked linings were reapplied to cars in passenger service and continued in service from 20,000 to 40,000 mi. and are still performing satisfactorily.

These tests are being continued to a conclusion, and the Committee suggests that member roads undertake similar tests as it is their opinion that considerable saving would result if the wholesale scrapping of journal bearings with cracked linings was better controlled.

A. R. A. Rules 66 and 84, Modifications.—The numerous cases of lubrication failures due to some member roads avoiding the requirements of Rule 66, and the fact that car owner now has no protection against improper work and inferior materials being used where bills are rendered for repacking of cars, is in the opinion of this Committee an unfair situation that should be remedied.

It is the opinion of the members that where cars are repacked, work should be guaranteed for a period of 60 days and joint evidence when taken for work not properly performed in accordance with requirements of Rule 66, should be final, also that cut journals be made car owner's responsibility.

The Committee believes that these recommendations, if adopted, would result in better grade of materials being used and better workmanship than now obtains in many cases.

Locomotives

In reply to question raised by member roads, Committee wishes to comment on:

Guide Bar Lubrication, Particularly the Bottom Bar, and Other than Forced Feed.—The majority of locomotives are still equipped with standard methods in use for many years, i. e., top guide bar lubricated with an oil cup with a needle feed, and bottom guide bar from a pocket in crosshead shoe filled with hair and waste.

Several roads are using a system which consists of two oil cups on top guide bar, one feeding to top of crosshead shoe and other feeding to sides of top guide bar. Inside of an oil cup there is a boss or tube cast integral with cup extending almost to the top. A wick of wool threads wound on wire is inserted in this tube, end of same extending to bottom of tube and other end laying in bottom of oil cup. On alligator type crossheads, bottom shoe contains a cavity packed with wool and curled hair, from which oil is fed to bottom guide bar through small hole drilled through crosshead shoe.

On Laird type crosshead with this oiling arrangement, holes are drilled through shoe to permit oil to pass to bottom guide.

One member road has approximately 300 locomotives equipped with Alemite lubrication of guides. With this arrangement on alligator type crossheads, a cavity is provided near each end of both top and bottom shoes. A 3/32-in. hole is drilled through shoe from this cavity. Shoes are made of Hunt-Spiller gun iron with babbitt inserts. The 3/32-in. grease hole at bearing face of shoe is counterbored ¼-in. deep and ½-in. diameter, to prevent babbitt being dragged across grease hole. This road reports the life of crosshead shoes more than doubled with this system of lubrication as compared with former system using needle feed oil cups on guides. Locomotives on extended runs operate 600 mi. on one filling of the grease cavities in crosshead shoes, without further attention.

Necessity of Alemite on Brake and Spring Gear Parts.—Alemite lubrication of these parts has been tried out on several roads. These trials have shown that where spring gear pins are doweled, Alemite lubrication is of no benefit, as grease cannot be forced to point of heaviest load if Alemite fitting is applied at this point. If Alemite fitting is applied at point away from heaviest load, grease will not work to this point. If pins are not doweled, there is sufficient revolving movement of the pins to carry grease to point of heaviest load.

However, it has been found that unless pins and bushings are thoroughly case hardened, more or less cutting action takes place and the metal cut away from pins and bushings forms a grinding compound with the grease, resulting in almost as great wear as on those not lubricated.

Where pins and bushings are thoroughly case hardened (not so-called potash hardened on blacksmith forge), and pins allowed to revolve, experiments indicate life of pins and bushings is at least doubled with Alemite lubrication.

Experiments have shown Alemite lubrication of brake gear parts not hardened, lengthens the life of them considerably. Where pins and bushings in brake gear parts are thoroughly case hardened, their life is apparently as long without Alemite lubrication as with it.

The report was signed by G. W. Ditmore (chairman), master car builder, Delaware & Hudson; P. Maddox, superintendent car department, Chesapeake & Ohio; G. C. Hirsch, mechanical inspector, New York Central; E. Von Bergen, general air brake lubricating and car heating engineer, Illinois Central; E. C. Cromwell, lubrication supervisor, Baltimore & Ohio, and H. P. Allstrand, principal assistant superintendent motive power and machinery, Chicago & North Western.

Action—Following some discussion it was decided that a change proposed in the specifications for reclaimed oil be referred to the Committee on Specifications for Materials for handling. The balance of the report was approved and referred to letter ballot.

Report on Prices For Labor And Materials

In order that the rules may currently provide an equitable basis for inter-road billing, the committee has continued the work of analyzing material, labor and new equipment costs in A. R. A. Interchange Rules 101, 107, 111 and 112 of the freight-car code, and Rules 21 and 22 of the passenger-car code, with a view of determining and recommending necessary changes to be made in supplement effective August 1, 1933.

Rule 101—All miscellaneous material prices in Rule 101 were rechecked as of March 1, 1933, quotations from purchasing agents of eleven railroads, representing 39 per cent of total freight-car ownership in the United States and Canada, indicating a general downward trend in material markets as indicated by detail recommendations for revisions shown under this rule.

Because of changes in Rules 11, 19, 62 and 66 recommended by the Arbitration Committee, Items 163 to 163-F inclusive, covering filled journal bearings, are eliminated.

Two new items are added and two additional items revised in table of friction-draft-gear prices, to cover additional types of such gears. Prices for Cardwell G and L types of gears have been set up on a new basis, excluding spring seats, and the table revised accordingly.

Two items in the table of arbitrary weights for miscellaneous items have been modified, to clarify the intent.

Rule 107—Item 42 modified to include heating of coupler yoke at gibs and tightening to coupler butt. Items 29, 102 and 166 clarified. Item 116 revised to provide for reversing of placards on tank cars equipped with metal inflammable placard holders.

Item 143 revised to include all types of longitudinal running board regardless of method of securement, in order to simplify

billing; also, Items 142 and 143 modified to make clear they do not apply to running boards on tank cars. Second note following Item 142 relocated under Item 143 for easier reference.

Item 148 modified to clarify the intent. Note following Item 288 relocated under Item 160 for better reference. Third note under Item 270 modified to apply to all types of wheels. New Item 290-A added, to simplify billing for paint, nails and screws.

Rule 111—Note under Item 4 relocated under Item 3 for better reference.

Item 13 modified to clarify the intent with respect to substitution of retaining valves. Second note following this item clarified.

Rule 112—Recommendations under this rule respecting reproduction pound prices of new freight train cars of all classes, are made in order that supplement of August 1, 1933, may reflect 1932 costs in lieu of figures shown in the present code.

With practically no equipment built new in 1932 and less than 5,000 cars in 1931, as compared with 18,000 to 51,000 cars in other years on which the per pound prices in Rule 112 were set up, no definite data was available on which to base prices to become effective August 1, 1933. In the absence of a definite factor to apply, based on a decrease in general labor and material prices since 1930, the committee recommends an arbitrary reduction of 15 per cent on per pound prices for all classes of freight cars with the exception of Classes B and C refrigerator cars on which a 10 per cent reduction is recommended, the latter based on data submitted by the refrigerator car owners in connection with cost of insulation and other material standard only to refrigerator car equipment.

As a result of cost study of the various classes of refrigerator cars, the committee recommends a differential of 3 per cent under the Class C refrigerator-car per-pound price as basis for the Class D price, and a differential of 8.65 per cent under the Class D refrigerator-car per-round price as basis for the Class E price. It is also recommended that the present differential of 8.15 per cent under the Class E refrigerator-car per-pound price as basis for the Class F price, be maintained.

A new item is added to Paragraph 10(c) of Section B of this rule, to provide additional allowance for cars equipped with "AB" air brakes.

Passenger Car Items

Passenger Rule 21—Items 18 and 26 are modified to clarify the intent. Interpretation following this rule will be eliminated on account of new Passenger Rule 10 as recommended by the Arbitration Committee.

Passenger Rule 22—Changes in material prices in a number of items under this rule are recommended, based on quotations as of March 1 from the purchasing agents of eleven representative railroads.

Item 11 is modified to eliminate the applied price for cut-out cocks and new price set up on material basis only, to facilitate billing and eliminate controversies. Items 52-A and 53-A are eliminated and covered in new note under Item 53.

Four new items are added to provide average charge and credit prices for steam end valves.

It is the intent of the committee to investigate labor costs again in October, also material prices if investigation is warranted, and if sufficient change develops, necessary revision will be made and inserted in the Rules effective January 1, 1934.

[The changes recommended in the existing rules were shown in detail on sheets attached to the report—EDITOR].

The report was signed by A. E. Calkins (chairman), superintendent rolling stock, New York Central; H. H. Harvey, general car foreman, Chicago, Burlington & Quincy; H. E. Myers, master car builder, Lehigh Valley; T. J. Boring, general foreman, M. C. B. Clearing House, Pennsylvania System; H. H. Boyd, assistant chief motive power and rolling stock; Canadian Pacific; A. E. Smith, vice-president, Union Tank Car Company; A. H. Gaebler, master car builder, General American Transportation System, Inc.; P. Kass, superintendent car department, Chicago, Rock Island & Pacific; F. J. Dodds, general car inspector, Atchison, Topeka & Santa Fe, and O. A. Wallace, supervisor car repairs, Atlantic Coast Line.

Action.—Chairman Calkins in presenting this report called attention to the fact that Item 104 (b) of Rule 101, under proposed rate, should be 86 cents instead of 77 cents. A member of the General Committee said that a considerable number of automobile box cars are being equipped with the Evans automobile loading device and that an additional allowance should be provided in the settlement prices for such cars to cover this device.

The report of the committee was adopted with the change suggested by Chairman Calkins, and it was decided to instruct the Committee on Prices for Labor and Materials to provide in Interchange Rule 112 an allowance for cars permanently equipped with auto loaders.

Report On Tank Cars

During the year the committee considered a total of 112 dockets and applications for approval of design of which

(a) Thirty-five covered new cars or new tanks for existing cars of the following classes:

Class	No. of Cars
ICC-103	188
ICC-103A	5
ICC-103B	14
ICC-103C	2
ICC-104	2
ICC-104A	5
ICC-105A300	2
ICC-105A400	10
ICC-201A35	7
Total	235

(b) Sixty-five applications covered alterations in existing equipment consisting of:

Application of heater coils.
Application of insulation.
Application of lead lining.
Application of rubber lining.
Capacity reduced.
Changing safety valve settings.
Conversion from Class ARA-IV to ARA-III.
Conversion to compartment cars.
Revamping to handle dry lading.

The classes and number of cars altered were as follows:

Class	No. of Cars
ARA-II	7
ARA-III	544
ARA-IV	3
ICC-103	152
ICC-103A	1
ICC-103B	5
ICC-104	10
ICC-105A300	1
Total	723

(c) Eleven applications for approval of tank car appurtenances as follows:

Applications	Tank-car appurtenances
5	Metal placard holders.
1	Hinged dome cover.
1	Screw type dome cover safety device.
1	Adaptor for outlet leg.
1	Metal running boards.
1	Bottom outlet valve.
1	Welding metal placard holders to tank shell.

(d) And one application requesting an extension of the effective date of paragraph 243(c) of the Interstate Commerce Commission Regulations.

Fusion Welded Tanks

Applications have been received for approval of one Class ICC-103C and ten Class ICC-103B fusion-welded tanks, fabricated in accordance with the A.S.M.E. Code for Class I fusion-welded non-fired pressure vessels, to be used for the transportation of regulatory commodities.

The committee has recommended to the Interstate Commerce Commission that experimental service trials of these tanks be authorized.

Extension of Effective Dates for Tank-Car Requirements in Interchange Rule 3

(a) The Tank Car Committee, after due consideration of the requests from various car owners for extension of time in which to meet the provisions of Interchange Rule 3 covering head block anchorage, recommended to the Arbitration Committee, in view of the present economic situation, that a further extension of one year be granted.

(b) On the owners' request for an extension of time in which to alter existing tank cars having wooden shims between the longitudinal anchorage and the underframe, the committee recommended that a further extension of time be granted even though it had previously been stated that no such extension would be granted.

Leakage of Safety Valves and Development of Improved Types

The Sub-committee on Safety Valves is continuing its work toward developing a safety valve so as to overcome the objections of the present standard valve showing slight leakages at the seat before predetermined internal pressure is reached, also that valve seats tight after pressure is relieved.

Patching of Tank Cars

The Committee on Tank Cars has continued its study of this

subject, but is not ready to submit its recommendations due to the many factors involved.

Reduction in Thickness of Interior Compartment Heads

A large portion of the applications submitted to the Committee are for approval of converting single-compartment cars having two or more compartments. In the case of such conversion cars are equipped, according to effective specifications, with

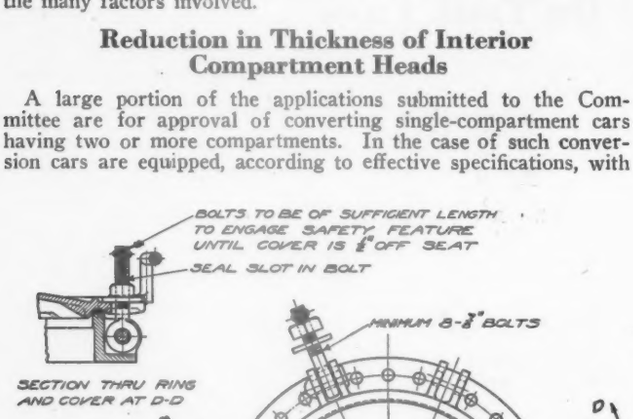

BOLTS TO BE OF SUFFICIENT LENGTH TO ENGAGE SAFETY FEATURE UNTIL COVER IS ⅛" OFF SEAT
SEAL SLOT IN BOLT
MINIMUM 8-⅞" BOLTS
SECTION THRU RING AND COVER AT D-D
SECTION B-B
16" MIN. DIA.
SECTION A-A
RIVETS MAY BE SPACED AS DESIRED
SECTION C-C
BOTTOM FACE OF DOME RING MAY BE FLAT OR SPHERICAL TO FIT CONTOUR OF DOME HEAD

Fig. 1—Approved design of dome ring with proposed new features

interior compartment heads of the same thickness as exterior heads required in new tanks of the same diameter.

Since it is felt this involves an unwarranted expense, the committee has recommended that the Interstate Commerce Commission container specifications be revised to permit the use of interior compartment heads ⅛ in. less in thickness than is now required for exterior tank heads.

A. R. A. Fundamental Dome-Ring and Cover Drawings

Paragraph 243(c) of the Interstate Commerce Commission Regulations, requiring an approved safeguard on dome closures of tank cars, handling certain commodities, making its removal from the manhole opening practically impossible while the car interior is subjected to vapor pressure of the lading, became effective October 1, 1932.

Fig. 1 covers the present A. R. A. fundamental type dome ring to which has been added the necessary features to bring this design in harmony with the proposed design.

The committee also submitted a drawing of the present A. R. A. fundamental type dome cover with an approved safety device (Fig. 2) which it proposed to submit along with the design shown in Fig. 1 to letter ballot for adoption as A. R. A. standard in place of the present Figs. 5 and 6.

The design of the safety feature illustrated in these drawings has been donated to the American Railway Association, free of patents or other restrictions, by the General American Tank Car Corporation.

Dome Covers for ICC-104-A and ICC-105-A Tank Cars

The committee also proposed that designs of dome covers for tank cars of Classes ICC-104-A and ICC-105-A, covered by drawings included in the report which have been agreed to by the industry, be submitted to letter ballot for adoption as recommended practice. Such adoption and inclusion in the A. R. A. Specifications for Tank Cars will be of assistance to all concerned in the design of new equipment.

The report was signed by G. S. Goodwin (chairman), assistant to general superintendent motive power, Chicago, Rock Island & Pacific; F. A. Isaacson, engineer car construction, Atchison, Topeka & Santa Fe; A. G. Trumbull, chief mechanical engineer, Chesapeake & Ohio; G. McCormick, general superintendent motive power, Southern Pacific; W. C. Lindner, chief car in-

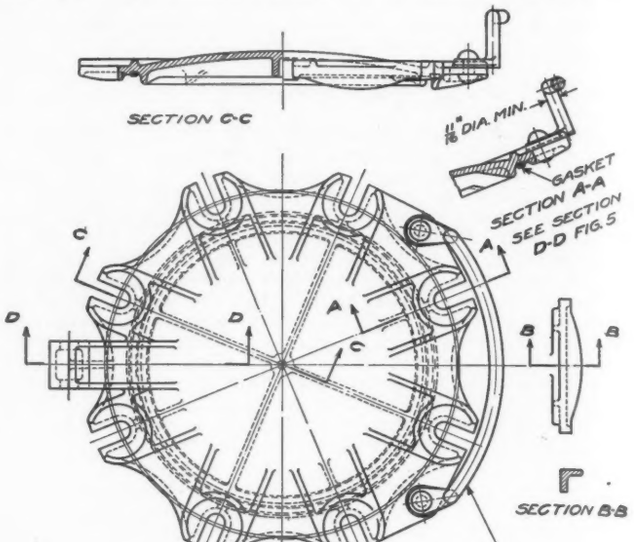


Fig. 2—Approved design of dome cover with safety feature added

spector, Pennsylvania; A. E. Smith, vice-president, Union Tank Car Company; T. Beaghen, Jr., superintendent car maintenance, Mexican Petroleum Corporation; G. E. Tiley, supervisor tank-car equipment, General Chemical Company; C. C. Meadows, master car builder, Tidal Refining Company; G. A. Young, head School of Mechanical Engineering, Purdue University, and F. Zeleny, engineer of tests, Chicago, Burlington & Quincy.

Action.—In presenting this report Chairman Goodwin explained that Figs. 5 and 6 in the original report (Figs. 1 and 2 in connection with this abstract) showing the fundamental type dome cover and ring were originally adopted as a standard of the association. He explained the action of the Committee on Tank Cars at its last meeting when it was decided to change the titles of these drawings to read: "An approved type of dome ring—Other approved designs may be used" and "An approved design of dome cover—Other approved designs may be used." He stated that this matter had received further consideration and that there was some question as to the authority of the committee to recommend the removal of a standard and replace it by a recommended practice. He stated that the recommendation now was that the title of these figures remain as at present with the addition of notes as follows: "Other approved devices may be used" and that the drawings should be continued as standard.

The report with these changes was approved and submitted to letter ballot.

Report on Material Specifications

The Committee on Specifications for Materials presented a report covering revised specifications for carbon-steel bars for railway springs; carbon-steel castings; lumber; hose for air, gas and oxygen; chain; elliptical springs and paint.

Carbon-Steel Bars for Railway Springs—To be revised in order to take care of changes that have been made in the Specifications for Helical and Elliptical Springs. It is recommended that this revision be adopted as recommended practice to replace the present standard specification.

Carbon-Steel Castings—As a result of co-operation with the

manufacturers, the physical property requirements have been modified so as to be more in line with the improvements that have been obtained with present foundry practice.

Par. 4 (a), to be revised to read: "4. Annealing.—(a) Castings shall be allowed to cool after pouring, to a temperature below the critical range. They shall then be uniformly reheated to the proper temperature to refine the grain and allowed to cool uniformly. Treatment may consist of full annealing, or of normalizing, or of normalizing followed by tempering."

Par. 8 (a) to be revised to read: "8. Tension Test.—(a) The steel shall conform to the following minimum requirements as to tensile properties:

	Grade A		Grade B
	Unannealed	Annealed	Annealed
Tensile strength, lbs. per sq. in.	60,000	60,000	70,000
Yield point, lbs. per sq. in.	30,000	30,000	38,000
Elongation in 2 in. not under, per cent.	22	24	24
Reduction of area not under, per cent	30	35	36"

Par. 8 (b) omit, and put the present 8 (c) as 8 (b) without further change.

It is recommended that this revision be adopted as recommended practice.

Lumber—It is recommended that the Specifications for Lumber, page 111 of the Manual, be withdrawn and replaced by revised specifications. This is a revision of the matter that was presented as information in 1930 corrected in conformity with the changes suggested by those in the lumber and railroad industries who provided constructive comments on the proposed grading rules. This revision has had consideration of a committee appointed by the Engineering Division, by the Car Construction Committee and by the National Lumber Manufacturers Association. [Exhibit "B", offered with the report, contained the complete revised specifications—EDITOR.]

It is recommended that this revision be adopted as Recommended Practice.

Hose, Air, Gas and Oxygen—The following changes are recommended to clarify the meaning in the paragraphs affected: "7. Protective Coating.—The protective coating, *when specified*, shall be of wire armor or woven cotton jacket, as follows:" No further change in other sections of this paragraph.

Par. 11. Tension Test of Tube and Cover.—In the third line insert the word "air" in front of "gas", making this read: ". . . air, gas and oxygen hose, etc." It is recommended that this revision be adopted as recommended practice.

Chain—Revise Par. 2 Material, to read as follows: "2. Material—The material shall be as follows: Crane Chain—Wrought iron, free from any admixture of iron scrap or steel. Proof Coil—Wrought iron or open-hearth steel. The wrought iron shall be free from any admixture of iron scrap or steel.

"Note—The term "iron scrap" applies only to foreign or bought scrap and does not include local mill products of crane chain or proof-coil quality."

The object of this change is to eliminate the permission to make wrought iron proof-coil chain out of reworked scrap.

It is recommended that this revision be adopted as recommended practice.

Elliptical Springs—To be revised to include requirements for heat treatment not previously covered.

It is recommended that this revision be adopted as recommended practice.

Paint and Paint Materials—It is recommended that all of the specifications listed below be withdrawn from the Manual, for the reason that inquiry among a number of members of the Association has developed a strong opinion that such specifications are matters for each railroad to decide for itself, and no useful purpose is served by having Association specifications for such material:

Japan Drier—Page 101
Liquid Paint Drier—Page 102A
Red Lead—Page 103
Red Lead and Oil—Page 104A
Red Lead Extended Paste Paint—Page 104C
White Lead—Page 105
Boiled Linseed Oil—Page 107
Raw Linseed Oil—Page 109
Mineral Spirits—Page 171
Black Paint—Page 169
Paint Reducing Oil—Page 293
Oxide of Iron Paste—Page 177
Turpentine—Page 271

It is suggested that these recommendations be submitted to letter ballot of the Association.

The report was signed by F. M. Waring (chairman), engineer of tests, Pennsylvania; T. D. Sedwick, engineer of tests, Chicago, Rock Island & Pacific; C. P. VanGundy, engineer of tests, Baltimore & Ohio; F. Zeleny, engineer of tests, Chicago, Burlington & Quincy; H. G. Burnham, engineer of tests, Northern Pacific; J. C. Ramage, engineer of tests, Southern; J. H. Gibboney, chief chemist, Norfolk & Western; H. W. Faus, engineer of tests, New York Central; E. E. Chapman, enginener of tests, Atchison, Topeka & Santa Fe; A. G. Hoppe, engineer of tests, Chicago, Milwaukee, St. Paul & Pacific, and H. P. Hass, engineer of tests, New York, New Haven & Hartford.

Action.—Chairman Waring stated that there were a number of corrections to be made before the letter ballot was prepared. Chairman Kiefer of the Car Construction Committee stated that the members of his committee had not unanimously approved the specifications for lumber because of some misunderstanding as to the moisture content specified. He stated that he would call the attention of the members of his committee to the fact that the moisture content stated in the specifications included in the report covered the lumber as shipped from the saw mill and did not cover the moisture content of lumber as applied to a car.

The report was approved and submitted to letter ballot.

Report of Committee on Wheels

The specification submitted for the single-plate reinforced-flange cast-iron wheels adopted as recommended practice in 1928 have been revised from year to year as necessary to keep pace with developments in the wheel foundries and wheel service.

The fourth revision of the Manufacturers' standard foundry practice requirements, dated March 1, 1933, was submitted to the committee at our last meeting, but they have not been thoroughly reviewed by the committee and cannot be recommended for adoption until next year. Copies of the latest requirements may be obtained, however, upon application to the secretary of the Mechanical Division.

The Manufacturers' Association has furnished three full size photographs to aid in establishing uniform measurements to determine depth of chill. Each photograph has been marked with a vertical line to indicate the point at which chill depth should be measured, and a horizontal line to indicate actual chill depth. Reproductions of the photographs were included in the report.

The annual report for 1932 recommended a change in the term "depth of clear white iron" to "depth of chill" without changing the depth limits. Further experience indicates that the limits specified at present are unnecessary and may be reduced ⅛ in.

The committee has been requested to clarify Item (d) under Table II Section 5 to avoid controversy when test wheels develop radial cracks in the wheel-rim face, which, under repeated blows of the tup, occasionally extend down into the rim fillet. This subject has been investigated at the manufacturers' plants and in wheel foundries operated by railroads represented on the committee, and it is the opinion of the committee that this item of the specification should be amplified to avoid unjust rejection of wheels.

The Association of Manufacturers of Chilled Car Wheels suggests a modification in Section 3, Chemical Composition, to promote the effort to reduce the graphitic carbon and hold the combined carbon under 0.90 per cent. The manufacturers' suggestion was considered by the committee and it is their opinion that the specification should be modified to indicate the total carbon desired, minimum 3.00 per cent.

The above changes in the specification are of considerable importance and the committee recommends that the present specification for cast iron wheels be again revised and submitted to letter ballot for adoption as recommended practice:

Proposed Form—Section 2, Chill (c). The depth of chill shall not be less than ½ in. and shall not exceed *1 in.* at the throat and *1⅛ in.* at the center line of tread. The blending of chill with the grey iron behind it shall be without any distinct line of demarcation. The depth of chill shall not vary more than ¼ in. around the tread in any one plane in the same wheel. These limits apply to all weights of wheels.

Section 3. Chemical Composition (a). The wheel shall conform to the following requirements as to chemical composition:

Combined carbon, maximum—0.90 per cent.

Total carbon desired, minimum—3.00 per cent.

Section 5. Drop Test.—Table II (d). If test wheel cracks in the plate with nine blows or less it will be considered as having failed. *The term "plate," as here used, does not include that portion of the wheel included in the fillets joining the rim proper and the plate proper.*

Cast-Iron Wheel Defects and Condemning Limits—The committee's report recognized that wheel conditions are causing considerable trouble and mentioned committee representatives have spent a great deal of time on different railroads and in wheel manufacturing plants investigating these matters. Major changes relating to cast-iron wheel defects were recommended to and adopted by the association during 1932 and the committee plans to make further recommendations as soon as these changes have been in force long enough to demonstrate their value. Lack

of information as to the cause of wheel removal is handicapping the work of the committee and, in co-operation with the Arbitration Committee, they have developed a series of forms for reporting the causes of wheel removals, these forms being included as a part of this year's report.

Wrought-Steel Wheels—This year's report included as information specifications revised in certain sections covering one-wear wrought-steel wheels together with several detail drawings of the wheel, and the committee offered the suggestion that the specifications be applied in actual use for a time prior to submission in the annual report for 1934 as recommended practice.

In addition to the design of the one-wear wrought-steel wheel referred to, the Technical Committee of the American Steel Manufacturers Association has co-operated with the Wheel Committee and agreed upon a reinforced flange and straight tapered tread for this type of wheel.

Wrought-Steel Wheel Defects and Condemning Limits—The defect referred to as a thermal check is described in detail in paragraph 35 and illustrated in the Wheel and Axle Manual. The committee emphasized the remarks in the 1932 report concerning this defect and pointed out that it may only be discovered by very close inspection and in its early stages does not appear dangerous, but several derailments have been reported by the railroads within the past few months, all of which were apparently caused by fractures which originated in thermal-check wrought-steel-wheel rims. There is no test available at present which will disclose the presence of stresses in a wheel without its destruction and wheel treads should be carefully inspected at originating terminal points to insure against the release of wheels having thermal checks in the rims.

Design of Cast-Steel Wheel—The American Steel Foundries has co-operated with the committee in the matter of a reinforced flange and single taper tread for the Davis one-wear cast-steel wheel. This design of tread and flange contour is the same as that referred to in connection with the one-wear wrought-steel wheel. In the case of the one-wear cast-steel wheel, the suggested design is submitted as information only.

Gages and Their Uses—The committee's report stated that so many complaints had been received regarding the use of obsolete and worn wheel and axle defect gages and the variations in new gages purchased from various sources of manufacture in railroad shops it was finally decided to request the co-operation of the American Standards Association in studying this situation, with the result that agreement has been reached as to what tolerances should apply to the essential gaging points on the following gages:

Minimum Flange Thickness Gage for Cast Iron Wheels. (Upper figure page B-41-1931 of Manual of Standards and Recommended Practice.)

Maximum Flange Thickness Gage for Cast Iron Wheels. (Page B-42-A-1931 in Manual of Standards and Recommended Practice.)

Wheel Defect, Worn Coupler Limit, Worn Journal Collar and Journal Fillet Gage. (Page 47-1929, Manual of Standards and Recommended Practice, or Fig. 1, Interchange Rules.)

Wheel Tread Worn Hollow Gage. (Page B-52, Manual of Standards and Recommended Practice, or Fig. 4-D, Interchange Rules.)

Tread Worn Hollow Limit Gage for Remounting Cast Iron Wheels. (Fig. 8-A, Interchange Rules.)

Limit Gage for Remounting Cast Iron Wheels less than 80,000 lbs. Capacity. One-wear Wrought and Cast Steel Wheels. (Upper figure page 45-1926, Manual of Standards and Recommended Practice, or Fig. 7 Interchange Rules.)

Limit Gage for Remounting Cast Iron Wheels 80,000 lbs Capacity and over. (Page 45-1926, Manual of Standards and Recommended Practice, or Fig. 7, Interchange Rules.)

Journal Length Gage. (Page B-42-D-1931, Manual of Standards and Recommended Practice, or Fig. 6-A, Interchange Rules.)

Mounting and Check Gage for Cast Iron and Cast Steel Wheels. (Page B-42-1931, Manual of Standards and Recommended Practice.)

Mounting and Check Gage for Wrought Steel Wheels. (Page 42-C-1926, Manual of Standards and Recommended Practice.)

Steel Wheel Service Metal Gage. (Page B-93-1931, Manual of Standards and Recommended Practice.)

Car Wheel Circumference Gage. Tape for 27-inch to 38-inch Wheels. (Illustration page B-37-1928, Manual of Standards and Recommended Practice and Fig. 122, Wheel and Axle Manual are subject to revision.)

Contour Limit Gage Types D & E Couplers. (Fig. A, Interchange Rules.)

Worn Through Chill Gage 33-inch Wheels. (Submitted as information only.)

[Note.—Drawings were included as a part of the report illustrating the points in question.—Editor.]

The title of each drawing conforms with the present use of the gage to which it refers. If, however, one-wear wrought- or cast-steel wheels are specified to have reinforced flanges as suggested in this report the cast iron wheel maximum and minimum flange thickness gages should be used in checking the flanges, and the mounting and check gage should be used in mounting the wheels with the increased flange thickness.

Wheel and Axle Manual.—Because of the fact that many of the cuts in the present Wheel and Axle Manual are now obsolete and that the present supply of Manuals is about exhausted, the committee will give preference to, and attempt a complete revision of this Manual during the coming year.

Mileage of Various Types of Wheels.—At the 1932 meeting the committee was requested to develop comparative information to show the mileage made by various types of wheels. The committee devoted a great deal of study to this question and has found it practically impossible to obtain information which would warrant definite comparison and conclusions on a mileage basis. It is suggested, therefore, that it is more important to enlist the co-operation of the railroads in securing data relating to the defects which cause wheel removals, and with this thought in mind the committee has devoted a great deal of attention to the development of symbols for wheel defects and the forms for recording and classifying such defects.

The report included complete specifications for wrought-carbon-steel wheels for freight-car service.

The report was signed by A. Knapp (chairman), inspecting engineer, New York Central; H. W. Jones, general superintendent motive power, Pennsylvania; C. T. Ripley, chief mechanical engineer, Atchison, Topeka & Santa Fe; O. C. Cromwell, assistant to chief motive power and equipment, Baltimore & Ohio; H. W. Coddington, engineer of tests, Norfolk & Western; J. Matthes, chief car inspector, Wabash; C. Petran, supervisor tools and machinery, Chicago, Milwaukee, St. Paul & Pacific; A. M. Johnsen, engineer of tests, Pullman Company, and D. Wood, engineer of tests, Southern Pacific.

Action.—The report of the committee was approved with instructions that recommendations for changes in the specifications be referred to letter ballot and that the tentative specification for one-wear wrought-steel wheels be printed in the letter ballot circular for the information of the members and for study during the coming year.

Report on Electric Rolling Stock

The Committee on Electric Rolling Stock held no meetings during the year, but reported that the subject "Factors affecting pantagraph design, maintenance and operation" is still under consideration, being held up pending experience which will be secured in connection with high-speed operation on the Pennsylvania between New York and Philadelphia, and that it is hoped to have this report ready for consideration next year. The major part of this year's report was divided into two parts, one of which dealt with various methods pursued by different railroads in cleaning traction motor equipment in place on the locomotive. This section of the report included in some detail the methods used on eight different railroads to care for this work.

The other section of the report dealt with the problem of cleaning ventilating air used in forced ventilation before it passes through the motor equipment on electric locomotives. The committee recognized the fact that the problem of cleaning the large volume of air required for modern equipment is in a measure different on each road due to climatic, service or other special conditions, and notes that while it is felt desirable to clean all air used from the standpoint of eliminating failures, space and other limitations make it impossible to do this on many locomotives. Therefore, only the air to certain pieces of equipment is cleaned; for example, the air for cooling transformers. Where it has been found that the simple method of using louvres was insufficient, oil filters, cloth screens, small mesh metal screens and centrifugal filters have been used and the report deals in some detail with the methods used and the results obtained with each of these types of devices. At least three of the large electrified roads are experimenting with various devices to keep out dry, fine, hard snow which is a difficult problem and the report lists several features that are desirable in devices or methods used to accomplish this purpose.

The report was signed by R. G. Henley (chairman), superintendent motive power, Norfolk & Western; J. H. Davis, chief engineer electric traction, Baltimore & Ohio; J. V. B. Duer, electrical engineer, Pennsylvania; J. W. Sasser, superintendent motive power, Virginian; R. Beeuwkes, electrical engineer, Chicago, Milwaukee, St. Paul & Pacific; H. A. Currie, electrical engineer, New York Central, and A. L. Ralston, mechanical superintendent, New York, New Haven & Hartford.

Draft Gear Springs—Past and Present*

By Louis E. Endsley†

STEEL springs were used alone as draft gears in American railway cars many years ago. The first arrangement was a single coil spring, somewhat like the present G spring consisting of an outer and inner coil. The load necessary to put the G spring solid is 30,360 lb. and the foot-pound capacity, solid, is approximately 2,200. With a spring weight of approximately 55 lb. the capacity in foot-pounds is about 40 lb. per pound of spring. The center coils of a coil spring taken alone have a capacity higher than the whole spring due to the end coils not all working. The capacity of the G spring center coil is about 40 ft.-lb. per pound of metal.

A form of spring not used very often is a straight steel rod. For instance, if we had a tempered steel rod 59 ft. long and 17/32 in. in diameter, we could apply a load at the end of this rod of 20,300 lb., which is the capacity of the outer coil alone of the G spring, and the same maximum stress of 90,000 lb. will stretch this rod 2⅛ in. The maximum stress in the G spring has always been figured by the old formula as 80,000 lb. Recent experiments by the Westinghouse Electric & Manufacturing Company showed that the old formula did not give the correct maximum stress on the inner surface of a coil spring, and under analysis the G spring will give a maximum of a little over 90,000 lb. per sq. in. This straight rod, weighing 44.5 lb. produces a capacity of about 39 ft.-lb. per pound of metal.

In other words, the straight rod under tension has practically the same spring capacity under the same stress as the coil spring. However, in a coil spring it is a torsion stress and in a straight rod it is a direct tension stress. However, if we only consider the center coils of the spring and the center of the long rod without the end connections of each, the coil spring is 25 per cent more efficient under the same stress than the straight rod, when we assume a modulus of elasticity of twelve million for the coil spring and thirty million for the tension-rod spring. To show this resilience of a long straight rod a comparison can be made in which a piano wire 1/16 in. in diameter and 60 ft. long was suspended from the roof of a high ceiling room and a seat fastened to the lower end. A 200-lb. man sitting in this seat would stretch this piano wire 1.60 in., and a 384-lb. weight would stretch it 3 in. This is within the elastic limit of the steel, for it is an easy thing to produce a small wire to carry a stress of 125,000 lb. per sq. in., which is below its elastic limit, and the 384-lb. weight produces 125,000 lb. per sq. in. This wire used as a spring under a maximum load of 384 lb. would have a capacity of 75 ft.-lb. per pound of wire. Alloy-Steel coil springs have also been used of small diameter wire that produce good results under 125,000 lb. stress, and if they are correctly designed they will produce a foot-pound capacity of 75 to 80 per pound of metal. This is about the limit of capacity that a coil spring without friction can produce. There was, however, produced some years ago a friction coil spring known as the Harvey friction spring. This spring consisted of two coils, one coil wound the same as any coil spring with tapered ends and another coil that was wound with a larger pitch diameter, but not as long and without tapered ends. The inner coil had conical surfaces on the outside and the outside coil had conical surfaces on the inside. After these two coils were made and tempered, the inner coil was threaded into the outer coil, the same as a bolt is threaded into a nut. When a load was applied to the inner coil and a small compression occurred, the outer coil was expanded and this caused the outer coil to slip both crosswise and lengthwise of the inner coil, the lengthwise slipping occurring only at the end of the outer coil. This produced friction between the inner and outer coils and gave this spring considerably higher capacity than the ordinary coil spring. The Harvey spring produced, as a draft gear, about 90 ft.-lb. per pound of metal.

Another form of spring that has been used in draft gears is the leaf spring. This is well illustrated in the original Waugh plate spring draft gear, where ¼-in. plates were used. The capacity of the spring in foot-pounds was never over about 40 lb. per pound of metal used. However, the maximum stress ran up a little over 125,000 lb. per sq. in. Some of the capacity was the result of friction between the plate ends.

A few years ago the ring spring was brought out and a capacity of 200-ft.-lb. per pound of steel in the spring has been developed. This is the highest capacity ever developed in a spring. It consists of a series of outer and inner integrally closed rings. The outer rings have conical surfaces on their inside and the inner rings conical surfaces on their outside. These rings are fitted together, the outer ring alternating and co-acting with the inner ones so as to form a column. When axial pressure is applied to this column, the outer rings will be expanded and the inner rings will be compressed and each conical surface will telescope into the adjacent one, the travel taking place between each pair of conical surfaces.

The capacity of a draft gear made up on these principles depends upon the size of the pocket in which it

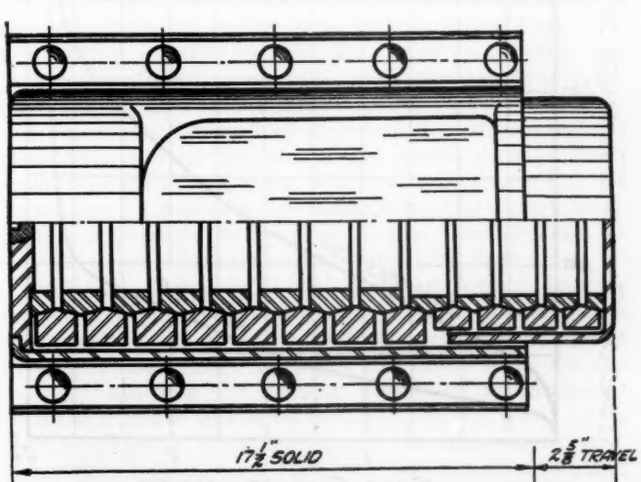


Fig. 1—Sectional view of ring-spring draft gear

*An abstract of a paper presented before the Railway Club of Pittsburgh. The author, in closing his paper, acknowledged the assistance of the Edgewater Steel Company for information concerning the ring-spring draft gear.

†Consulting Engineer, Pittsburgh, Pa.

is to go and upon what stress can be safely carried by the steel. Thus, it is desirable to have a steel that will carry a high stress without failure, both in tension and compression. At the present time the outer rings, which are in tension, carry a working stress when solid of approximately 125,000 lb. per sq. in., and the inner rings, which are in compression, carry a stress of approximately 210,000 lb. per sq. in. In order to take care of these comparatively high stresses, a new form of manufacture of the ring had to be resorted to. The ring is manufactured by shearing cylinders of metal from a round bar, much less in diameter than the final ring. Each cylinder of metal is pierced and rolled on all four sides until its outside diameter is approximately $8\frac{3}{16}$ in. for the outer rings and $6\frac{3}{16}$ in. for the inner rings. This piercing of a small slug out of the center of the bar eliminates the ingot core that might have been left when the bar was originally rolled.

After some experimenting it was found that if the bar to be sheared was heated to a temperature of 1,000 deg. F., the alloy steel used had a clean, square break, producing very accurate weights of slugs. There are no finishing cuts made of these draft-gear rings; they are only sandblasted.

The elastic limit of the steel after treating is between 180,000 and 190,00 lb. per sq. in. Thus it will be seen that the inner rings are stressed above their original elastic limit, but a new elastic limit is created by making the inner rings just a little larger than they are in the finished gear, so that in the first compression after assembling of the gear, the inner rings are given a permanent set. There are five or more complete compressions made on each gear. This allows some tolerance in manufacture. This high stress can do no damage, as the inner ring is under compression, but gives the metal in the inner ring a very high efficiency from the standpoint of foot-pounds of work per pound of metal.

Another problem which developed was that of the method of treatment of the steel to produce a ring that would be capable of working at high tension and at the same time stand the high surface pressure between the conical surfaces—as much as 40,000 to 50,000 lb. per sq. in. It is a known fact that metals of the same composition and heat treatment do not work together as well as in friction contacts as two metals of different heat treatment or composition. In the manufacture of these rings the inner and outer rings are given different treatment, thereby eliminating galling.

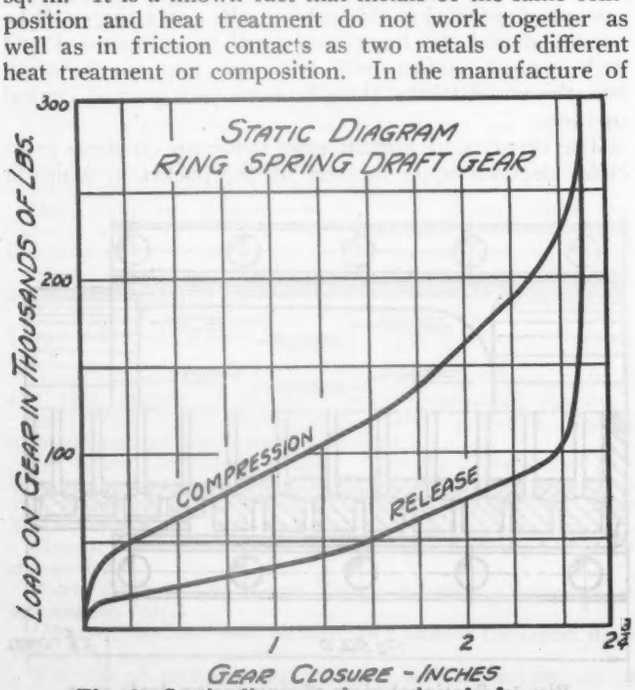


Fig. 2—Static diagram ring-spring draft gear

Another discovery was that the outside surface of the rolled bar during the original rolling and heating of the slug for forging decarburized some of the surface, and this decarburization is finally rolled to the outside surface of the rings. This is the wearing surface of the inner ring and this decarburization is corrected by a treatment which recarburizes this surface on the inner ring. This recarburizing of the surface can be done with safety on rings that are in compression.

The outer rings, due to the piercing of the slug and the rolling from a small to a large diameter, shows very slight decarburization on the wearing surface, so these rings are cyanided. This gives a very uniform hardness that is considerably above the surface hardness of the carburized inner ring.

Another problem which had to be solved before the ring spring acted in a satisfactory manner was that of providing a lubricant for the rubbing surfaces. After many tests a result was obtained by using two types of grease, each kind containing about 30 per cent by weight of graphite, one rather stiff grease used to coat the rings when they are assembled and a lighter grease to provide continuous lubrication.

The problem of securing the proper coefficient of friction is very important. The coefficient that is now obtained is approximately 10 per cent. Fig. 1 shows a freight-car draft gear with the twelve outer and eleven full inner rings and two half inner rings, having a total capacity of approximately 27,000 ft.-lb. Its release capacity in foot-pounds is 11,000. Thus, the gear absorbs 16,000 ft.-lb., which is about 60 per cent of the total capacity. The weight of all the rings in this draft gear is 150 lb. As compared to the coil spring the ring spring has a capacity of 180 ft.-lb. per pound of metal.

From an inspection of the ring spring it is apparent that the inner and outer rings receive the same amount of force; that is, there is the same pressure on the inner rings as the outer rings; they merely react on each other. The outer rings are greater in cross section than the inner rings and have less stress than the inner rings. The expansion of the outer rings and the contraction of the inner rings are proportional to their average diameter when under the same stress, but as the inner rings are also under a greater stress, the product of the size and stress is the real comparison, so the following formula is given to make this direct comparison:

$$T = \frac{D\,S}{M}$$

in which

T = the total expansion or contraction in inches
D = the mean diameter of the ring in question
S = the stress in pounds per square inch
M = thirty million, or the modulus of elasticity of the steel

This formula shows that the outer ring expands .029 in. and the inner ring compresses .037 in. and that the total movement of both rings amounts to .066 in. Of this, the inner rings get 56 per cent and the outer rings 44 per cent. The loads must be equal on the two sets of rings, so that the inner rings, which weigh 45 lb., do 56 per cent of the work and figure a total of 336 ft.-lb. per pound of metal, this due to all metal being in high compression stress. This is over eight times as much as the capacity of the G spring and the outer ring has a foot-pound capacity of 113 ft.-lb. This is over 2¾ times that of the G spring.

The force-closure curve is shown in Fig. 2. Here the pressure is plotted against the travel of the gear. It will be seen that the compression line starts at about 30,000 lb. and is a straight line from 50,000 to about 110,000 lb. Here it takes a steeper slope. This

is due to the preliminary rings going solid at about this point, and after this point the main heavier rings give all the movement. The release has the same characteristics, for at about the same travel of 1½ in., the curve makes the same movement to a lower slope on the release line. The curve shows that for the freight-car gear the rings are assembled in the housing under a compression of about ⅜ in. This serves for two purposes: until there has been considerable wear there will be no slack in the gear, and the oil placed in for lubrication cannot get out, but will remain within the gear until all original compression has been lost.

It is the writer's opinion that the ring-spring draft gear as developed has a capacity that is about the limit of the present size of pocket for draft gears. I believe that American railroads need a larger capacity, but until more room is allowed for the draft gear, the limit of capacity has been reached. For the 70-ton and 90-ton cars a draft gear that has a capacity of 40,000 or 50,000 ft.-lb. is desirable, but this will require a larger pocket and probably an increase in the travel of the draft gear in compression at least of an inch or more, in order that the final pressure will not be too high for the coupler shank. For, if the travel is kept at 2¾ in. and 50,000 ft.-lb. is developed, the final pressure on the coupler shank will be at or above its elastic limit.

Tendencies in Freight Car Design*

By P. P. Barthelmy

The small light-capacity car — Low tare weight — Rough usage — Containers

AS a result of the business depression, and in the interest of operating economy, there has been a systematic withdrawal from active service of the older freight cars, particularly those requiring extensive repairs or more or less expensive betterments. It has been possible, as well as immediately profitable, to utilize for the existing limited business the better and later types of cars—those that could be operated with the least maintenance attention and cost. As a consequence, also, the surplus high commodity cars have been assigned to the next lower grade of service, and so on down the line, thereby effecting a further economy by reducing commodity repairs. Limiting the number of cars used has made it possible to confine maintenance work to a greatly reduced number of cars. There has also been an appreciable saving on the cars temporarily stored or withdrawn from service, in that such time-limit items as air brake cleaning, box repacking, reweighing, etc., may be deferred until such time as these cars are again required for service.

There can be no doubt but that many of the cars now stored will never be returned to active revenue service, since they will have accumulated so much commodity and other depreciation that the repair costs, added to such betterments as may be necessary, will be so comparatively high that it will be more economical to purchase new equipment. Many of these cars are basically weak because of the older and lighter construction and the aged materials. The ordinary operating repair cost on such cars is always high, since they have passed into that repair cycle where necessary renewals have reached the so-called constant stage, whereas a new unit will run several years without requiring any appreciable running or commodity repairs.

The Smaller, Lighter Car

Much has been said regarding the size and capacity of the freight car, particularly regarding a smaller, lighter, and more flexible unit. It is, of course, true that smaller cars, or cars of special construction, could often be used advantageously if they were available. Where the demand for such cars is sufficient and regular, furnishing them would be warranted, but if the demand is scattered and irregular so many cars would be required, so much idle car time and empty car haul involved, that it would impose an overburden on the handling road and on the car owner.

Much of the small-lot shipment that would make a small unit pay may be of a temporary character, due to present business conditions. This may be greatly changed when the size of shipments increases. Since the service life of a freight car is twenty years or more, and it is not feasible to change the size of a car from small to large, or vice versa, there must be apparent more than just a temporary demand to warrant an extensive investment in such special equipment. These small units will ordinarily cost more and be more expensive to operate on a tonnage capacity basis than the ordinary car since, except in isolated cases, they must be handled in regular freight-train service and must, therefore, be built with sufficient strength to withstand that kind of handling. This means that couplers, draft gears, draft members, and underframe, in particular, will have to be equal in strength to that of similar parts on the standard car. As a result it is going to be difficult to build an effective and safe unit without having the ratio of tare weight to revenue load capacity very high.

Were it possible to keep such small units segregated in all train and car operations, and handle them in small trains, specially light units could be built at a much reduced cost. Obviously this is impracticable though some writers apparently have failed to give consideration to this phase of railroading when advancing their ideas.

Such bulk shipments as coal, iron, ores, grains, lumber, live stock, machinery, products of the steel mills, long haul bulk orchard and vegetable products, etc., will not change to smaller, but rather to larger car units, since the net cost per ton-mile for hauling and handling decreases with the increase in size of car.

In considering the European car, so often mentioned, it is well to bear in mind that their cars are all small, and are no doubt suitable for service conditions obtaining in the countries where they are used. Also, remember that

* This article is one of the most comprehensive statements we have received in the discussion which was initiated by the interview with the freight traffic officer, published in the *Railway Mechanical Engineer* of May, 1933. Comments on this interview also appeared in the June number.—Editor.

with these small cars, in most cases equipped with neither automatic couplers nor friction draft gears, switching operations and train makeup work are very slow. With these very slow switching movements, involving only negligible impact shocks, a very light construction is possible, but imagine the predicament of the yardmaster, even in an ordinary American train yard, trying to clear his daily tonnage under such conditions.

The opinion is sometimes expressed that the present car is over-standardized in that it lacks sufficient service flexibility. Here again we must be cautious, bearing in mind that the service life of the car is about twenty years and we must, therefore, build for the future, and not just to meet immediate conditions. We must, therefore, look, as far as is practical into the future, to anticipate the needs during the practical life of the unit under consideration, and coordinate the present trend with expected future needs. That the present car has so effectively met conditions speaks well for the car engineering fraternity. But freight operating conditions have taken on a marked change, particularly regarding service speed, so that freight trains are making practically passenger-train time, establishing a service, the demand for which is not going to disappear with the pick-up in business.

Low Tare Weight Important

Low tare weight is of primary importance, but fast train service does not necessarily mean that the cars must be of very small and very light construction, as is evidenced from the speeds now being made by freight trains, particularly those handling merchandise. Reduced weights would affect the handling of such trains in that it would cost less to haul them, and would make it possible to get the train moving to full speed in a shorter time, and would also make it possible to bring the train to a stop in less time, but there are many other conditions that impose speed limits besides the weight of the car. Still higher train speeds are to be expected in the future and it becomes necessary therefore, when working up designs for future cars, small or large, as well as when conditioning existing cars, to keep these conditions well in mind.

Two important factors must be considered, safety for the high speeds and low tare weights to make the movement as economical as possible. The conventional freight-car truck, particularly the truck spring arrangements, would seem to be the first hazard. There are several makes of cushion or shock absorbing springs and other special truck-spring arrangements, the use of which it would seem will add greatly to the running safety of the car. Most of these are adaptable to use in the present type of truck with little or no change in related parts of the truck. They also serve to help keep down tare weight. There are also car-truck assemblies embodying features designed to make possible higher, safe freight car movements.

Tare weight must be brought down to the lowest figure possible and yet not reduce the strength below safe limits since the most expensive car to operate is the one that is continually breaking down because of light and weak construction. We should profit more from the experience of the automotive industry, particularly in the employment of alloy steels, providing such use does not bring about too great an increase in cost. The judicious use of suitable alloy steels would make possible a weight reduction in both cast and structural parts.

Other items the weight of which may be reduced include the use of one-wear wrought wheels; lighter steel ends and sides, side doors and hangings; pressed and rolled sections; lighter roof, etc. Many specialties are too heavy. This may be due to carelessness in design of details, or to lack of a more intimate knowledge as to just what service punishment the device will have to withstand. Too frequently a device or other part of a car fails and, without making a careful analysis of all conditions associated with the failure, the maker of the specialty is blamed. To protect his device from such criticism he proceeds to strengthen it by adding more weight, whereas the original design may already have had the necessary strength. If all devices on a car are to be so strong that they will safely withstand such rough service as the car may receive only once in its normal service life, then we must expect to haul around a great mass of unnecessary weight. Obviously it is important, more so than ever before, that the movement of the loaded car be not interrupted by mechanical failure. This is also true to a lesser degree of the empty car movement. Therefore, a practical middle ground must be found for reducing weight without sacrificing necessary strength.

If car coupling impact shocks could be positively controlled a great saving in car weight could be effected since much of the tare weight of the present car is simply an overburden that serves only as a protection against these excessive coupling shocks. By keeping car impact shocks within the protective capacity of the draft gear much weight could be trimmed from the parts directly and indirectly affected, and there would also be a big reduction in damage claims, as well as in car maintenance costs.

The Use of Containers

More flexibility in the shipping container and container car, which would increase the demand for them, would take care of much of the small-lot shipping, and reduce the demand for small cars. In this field lie great opportunities for the development of adaptable designs and constructions, and for further standardization of size, etc., of both container and container car.

Some of the containers of today are, generally speaking, much too heavy, making them awkward to handle and adding that much to the dead haul, both empty and loaded. Here again should be adopted every possible means for reducing tare weight. This includes a more thorough analysis of the stresses to which the containers will be subjected and the adoption of designs to meet such requirements, and at the same time eliminate every unnecessary pound of weight. This may cause an increase in first cost, but it will result in hauling and handling economies. This suggests the use of alloy steels, forming and welding to eliminate unnecessary riveted seams and joints, use of castings instead of built-up parts or forgings, where a saving in weight may be effected by the better distribution of metal.

The design of the container car is of equal importance. The container anchorage to the car should be standardized, also the size and outside fittings of the containers. Suitable means for protecting the containers against damage from car-switching and train-handling shocks is of primary importance. Where a "peddler" container car is used means must be provided to anchor securely the partial load.

Some containers lack the necessary handling flexibility to make them more generally popular. A container car and containers so designed as to eliminate the need for handling cranes would help greatly. The arrangement should be such that the shipper's truck could back up to the side of the car and pull the container from the car to the truck, or vice versa. There are readily apparent difficulties involved in the working out of such a plan, but none that would be seemingly insurmountable.

EDITORIALS

Research and the Railways

A remarkable moving panorama of the developments in railway transportation made possible by a long list of engineering research projects which have been carried out during the past forty years was presented by the program at the Railroad Division sessions during the spring meeting of the American Society of Mechanical Engineers. This meeting was held at Chicago during Engineering Week in connection with the Century of Progress Exposition and the Railroad Division's program was devoted to a review of the part which research has played in the technical development of American steam-railway transportation. Few industries can present a record of development in which engineering research and investigation have played a larger part and probably none can present a record in which research projects received their inspiration from as many separate sources and have yet been co-ordinated by a high degree of co-operation wherever this has been necessary or desirable.

The Scope of Research Projects

Investigations fully qualifying as engineering research projects and underlying developments in motive power and rolling stock that have made American railroads the most economical and efficient mass transportation machine in the world have ranged all the way from the development of fundamental principles in the application of science to programs for proof testing of new types of equipment or facilities involving the expenditure of hundreds of thousands of dollars. Some of these investigations have been inspired by the vision of individuals whose interest was primarily to further the welfare of the transportation industry. Others were initiated by the universities which have long specialized in training engineers for the railways and manufacturers of railway equipment. Others have been inspired by commercial organizations whose interest was that of developing a profitable business in furnishing the railways with improved facilities. Other projects have been initiated by railway officers acting through various voluntary associations and by the American Railway Association, officially representing the railway industry as a whole. Irrespective of the sources of the initial inspiration few of these projects have been carried out by a single interest acting alone. To many of them railways, manufacturing industries, colleges and individuals have contributed on a cooperative basis in bringing to fruition developments which have been of incalculable value to the railways and the public they serve.

No review of research in the field of railway transportation during the past half century is complete which does not cover the work of the late Dr. W. F. M. Goss. His energy and vision of the possibilities of systematic research had much to do with the development of facilities for conducting investigations of this kind which have since played an important part in the successful conduct of many research projects. The value of what he initiated has been so completely demonstrated during the past forty years that the character and scope of facilities available for investigations in the technique of railway equipment design and operation have been constantly increasing throughout that period.

Aside from the research and development work which has been done in fields confined largely to railway transportation, the railway industry has profited and will continue to profit by fundamental research conducted by the engineering profession through its national organizations and by certain research foundations. It has also profited by the developments of industries producing materials of much wider application than to the railroads alone.

A Misinterpretation

During the past year a number of critics of the railways have severely indicted them for a lack of research activities of the kind which, according to these critics, has played so large a part in the advancement made by other industries. One of the industries which has been cited in this connection is the automobile manufacturing industry. In comparing the railways with the manufacturers of automobiles these critics overlook a fundamental difference in the relation of the two industries to transportation. The manufacturers of automobiles are not in the business of conducting transportation, but produce the facilities with which their customers produce a variety of transportation services. The railroads, on the other hand, are in the business of conducting transportation and are not in the business of producing facilities with which to carry on that business. Other industries operating independently have always produced the locomotives, the cars and the locomotive and car specialties which make up the mobile part of the railway plant, while the steel industry, independent tie producers, lumber manufacturers and the producers of many other materials and facilities provide the materials from which roadway and track structures are built.

Scarcely one of these industries has not undertaken research projects, some of them of a continuing character, the objective of which is the development of better materials or improved facilities for the use of their customers, the railroads.

It is not strange, therefore, that in any review of research as applied to steam railway developments, just as in all other industries, a predominating proportion of the work will be found to have been conducted by the seller in an effort to improve his product for the buyers who constitute his market.

Character of Research Conducted by the Railways

But the railways themselves have by no means been slow in utilizing the methods of engineering research where problems affecting safety, efficiency of operation in interchange or the satisfactory functioning of materials or devices in railway operation are involved. A notable example of projects of this character pertaining to railway equipment are the brake tests completed during 1931 which determined the extent to which specifications for the functions of a satisfactory freight-car brake tentatively established by the Interstate Commerce Commission were subjected to the proof of service conditions and the functioning of a brake developed by the manufacturers altered and adjusted into its final commercial form. Another is the automatic train-line connector investigation now under way in which, in co-

operation with the Interstate Commerce Commission, the train-service brotherhoods and numerous inventors of connector devices, the principles of a satisfactory device for universal interchange will undoubtedly be estabtablished. Still another is the work being done in the draft-gear laboratory of the American Railway Association which was first directed toward clarifying widely divergent opinions as to the requisites of a satisfactory shock-cushioning device for railway cars, and, second, determination of those commercial devices which satisfactorily meet the requisites established.

Despite the criticisms which have been levelled at the steam railway industry in this matter of research, the American Railway Association is showing no disposition to assume the attitude toward research suggested by some of its critics. In matters pertaining to equipment the Mechanical Division of the Association retained the services of a director of research for the conduct of its extensive brake investigation and for the automatic train-line connector investigation now under way. It has the services of a draft-gear engineer whose time has been devoted to its project for the development and standardization of draft-gear requisites. A committee of the American Railway Engineering Association has been devoting its attention for years to a study of rail stresses and to the improvement of the structure of the rail. No doubt if other specific projects of common interest to all the railways in the matter of equipment design in relation to operation present themselves, the services of the director of research will be retained for the consideration of these projects by the Mechanical Division. More than this can accomplish nothing for the railroads and would tend to slow up, rather than accelerate, the rate at which improvements in railway equipment become available to the railways for the benefit of the public they serve.

A Period of Transition

The century of development through which the railway industry has passed has step by step refined America's railways into a highly efficient mass transportation machine. Just as low costs of production in other industries have been the result of highly systematized large-scale production methods, so have the low costs of American railway transportation been the result of the highly systematized methods of assembling and operating trains of great tonnage. For many years the American public was willing to accept the corollaries of these mass methods as they affect the time, frequency and place of deliveries. The advent of the motor truck operating on hard roads has led to the development of a type of transportation which is relatively flexible with respect to the time, frequency and place of receipts and deliveries. The private automobile and, to a lesser extent, the motor bus have similarly affected long accepted conditions pertaining to travel by railway.

It is scarcely conceivable that with its large and widely scattered industrial population the North American continent can dispense with the economic advantages of mass transportation which the railroads alone can furnish. It has, however, become an acute question whether, in the case of freight, the railway may not be developed into a more flexible machine for serving the public in the matter of collections, deliveries, commercial shipping units, etc., without sacrificing the essentials of mass transportation, and whether it may not be possible to render a cheaper or faster or more comfortable and attractive passenger service which may prevent the continuing encroachment of competing agencies on the volume of passenger service and revenues.

These questions involve many intricate problems, some of which are technical and others of a purely business nature. The two, however, are likely to be closely interlocked and changes in the business approach may make necessary even revolutionary changes in some of the details of equipment and operating methods. The future health of America's railways and continued improvement in the service they render, therefore, now depend as much as, if not more than, ever on the unrestrained exercise of inventive genius and of engineering investigation and research which now form such an essential part in bringing inventions to a state of practical utility.

Some of the most important work of the Mechanical Division of the American Railway Association and its predecessor associations has been the establishment of standards of interchange, standard details and complete standard units of equipment. Its work in the future is likely to be judged more by the wisdom with which it encourages the developments of materials and designs which may make many of its established standards obsolete. The field for railway research in the future should logically be no more confined to that conducted under the control of the railroads themselves than has been the case in the past.

What About the Supervision?

L. F. Loree, president of the Delaware & Hudson, made a rather striking statement in a commencement address at the Rensselaer Polytechnic Institute last month. "A catastrophe such as we are working through wipes out of the field of management one-third to one-half of those who occupied it and you will find, as business picks up, as I did in 1880, the most active demand for your services and the greatest opportunities for your success." During the prolonged depression some of the older officers and supervisors have died and have not been replaced. Some have retired because of old age or infirmities and the positions have been left open for the time being. Others have been demoted or furloughed, some going into other lines of business and others patiently waiting for the resumption of activities. Some of those who have been dropped out temporarily have lost their morale and may not be able to stage a comeback.

Fortunately a movement was started a decade or two ago, largely by the supervisors and foremen themselves, to study the art of supervision, in order better to qualify for such positions. This movement took a number of different forms, including foremans' study classes and discussion groups, supervisors' associations, special staff conferences, etc. Such training, in many instances, has prepared the supervisors better to meet changing conditions and to understand the new and more severe responsibilities which they will be expected to carry. A number of these foremen's clubs, or supervisors' associations have continued to function throughout the depression, thus aiding greatly in maintaining the morale and at the same time helping to give the members a better conception of their changing duties and responsibilities. It may be of interest to note that in many industrial communities, particularly in the eastern part of the country, plant officers and executives have united to form local industrial executives' organizations. A recent review showed that a surprisingly large number of these organizations have continued to function actively and more or less aggressively during the past three years.

So much good can be accomplished by such clubs, and they are of such great inspiration to the members,

that it may not be out of place to suggest that every possible effort be made to revive them where they have been discontinued. Where such club facilities are not available, other ways can be found by the progressive supervisor to study and perfect himself in the art of supervision.

Lighter Parts of Alloy Steel

It has been suggested in these columns that the railroads have not approached a consideration of the possibilities of the use of alloy steels in locomotive construction with an entirely open mind. Because of the fact that the introduction of these materials a few years ago involved shop practices, particularly in forging, with which the railroads were not entirely familiar and for which they were not equipped, failures resulted in many instances which served to dull the enthusiasm of mechanical men for alloy steels. Though it was not realized at the time, locomotive weights were gradually working toward a limit which seems now to have been reached. Regardless of the apparent unwillingness of many to experiment with new and to them then untried materials, the problem of weight reduction, especially in revolving and reciprocating parts, was becoming acute and has more recently been brought to a head by the study that has been given to the question of proper counterbalancing.

The Committee on Locomotive Construction in its report to the Mechanical Division this year indicates that there is real need of a more elaborate study of the counterbalancing problem in its relation to both right-of-way and locomotive maintenance and in raising a question offers a possible solution in the following quotation from the report:

"The real question to determine is: Which is permitted to suffer most, the rail and track structures, or the locomotive? For, certainly, if the recurring load is lifted from the track, it must be borne by the boxes, frames and other parts of the running gear of the locomotive, whether considered as a percentage of the reciprocating weight, the ratio of the unbalanced weight to the total weight, or something else. A series of tests might be made with instruments to determine the magnitude of these forces and movements and thereby increase the total sum of human knowledge. It is doubtful, however, if a compromise could be made even then that would be perfectly satisfactory both to bridge and right-of-way interests and to those operating and caring for the locomotive.

"There appears to be, however, one aid left which has long been recognized but not given utmost consideration it deserves; namely, that of lightening the reciprocating parts by use of higher strength alloy steels and non-ferrous metals. Lately many metallurgical advances have been made that were eagerly taken up by other industries. Perhaps our present steels of 60,000 to 80,000 lb. per sq. in. tensile strength should be replaced by those of 100,000 to 120,000 lb. tensile strength, effecting a saving of 30 to 40 per cent in weight with advantageous results.

"It is believed with the use of such alloy steels for main rods, crossheads, pistons and piston rods, and possibly aluminum alloy crosshead shoes and piston bull rings, that the unbalanced reciprocating weight could be reduced several hundred pounds per side. When it is realized that any addition or reduction in the reciprocating weight increases or decreases the force on the driving boxes by 45 to 55 times its amount at diameter speed, or by 64 to 78 times the force tending to shake the whole locomotive, it can be appreciated that even a slight reduction of weight in these parts is worth while. Equally, then, some of this reduction could be applied to reduce the reciprocating balance, which also is multiplied by the greater figure above stated to include both sides and this also may be amplified by as much as 60 for the bridge stresses when the recurring load synchronizes with the natural frequency of the span."

The use of alloy steels will not only aid in the solution of the problem of weight reduction for the reasons already realized, but also should simplify the still more difficult approach to the higher operating speeds which the future will demand.

The Business Outlook

Freight car loadings for the week ended June 24 passed the 600,000 mark for the first time since last October—reached 604,668, to be exact. Indications are that they will go still higher for the week ending July 1, thus making the eighth consecutive week in which they have exceeded the corresponding loadings for last year. The electric power production curve shows similar characteristics, and from every nook and corner of the country come reports of more active business. The price of farm products continues to rise at a faster rate than that of manufactured commodities, thus promising a more active buying movement in the agricultural districts. Attendance at the Century of Progress Exposition has greatly surpassed expectations and optimism reigns in Chicago. Detroit, hard hit by the slow-down in the automotive business, is coming back with a wallop.

Railroad repair shops are opening up and the railroads are beginning to order repair parts and a certain amount of small tools and shop equipment to replace that which has been worn out and which simply cannot continue to function—some of it has gone the way of the "one-horse shay." Railroad managers, greatly concerned with troublesome traffic and competitive problems, are growing more and more hopeful as earnings continue to increase. Scarred deeply by the desperate conditions through which they have passed, they are more or less hesitant about loosening up the purse strings to take up deferred maintenance and put the plant in condition for the still heavier business which seems impending.

The long strings of dilapidated freight cars on side tracks and of large groups of locomotives at the shops awaiting heavy repairs are danger signals which are giving mechanical-department officers much concern. Can the equipment be put back into good condition early enough to prevent the congestions which were so familiar in the early twenties, and which will be exceedingly damaging to the railroads if they recur? Here is a task that must be handled with tact and real business ability. Have you a thoroughly worked out program to make the most effective use of every dollar allotted to you for maintenance and repairs? Do you know how to get the best possible results with the least effort and expenditure? Recent years have been trying ones because of the breaking down of organizations, but now comes a gigantic task of whipping the equipment-maintenance organization back into shape and putting the equipment in condition to meet the revival of business which has been gathering force slowly, but steadily, during recent months.

THE READER'S PAGE

Scientific Cut-Off Control Advocated

To the Editor:

Your editorial "An Important Void in Locomotive Operation" in the May *Railway Mechanical Engineer* cited the lack of adequate attention to cut-off selection and indication or control. I have copied the tractive-force-horsepower-speed chart mentioned in your editorial and added the cut-off information illustrated, which, on account of little use usually made of it, is not generally presented with charted or tabulated maximum tractive force and horse-power output information. Not only from the standpoint of the engineman and the mechanical department, but from that of the dispatcher, trainmaster, superintendent and the transportation departments generally, the use of this cut-off information should be of particular value in operation.

From this supplementary chart, maximum permissible cut-offs may be ascertained for any speed, say 30 m.p.h., by projecting vertically from that speed in the speed

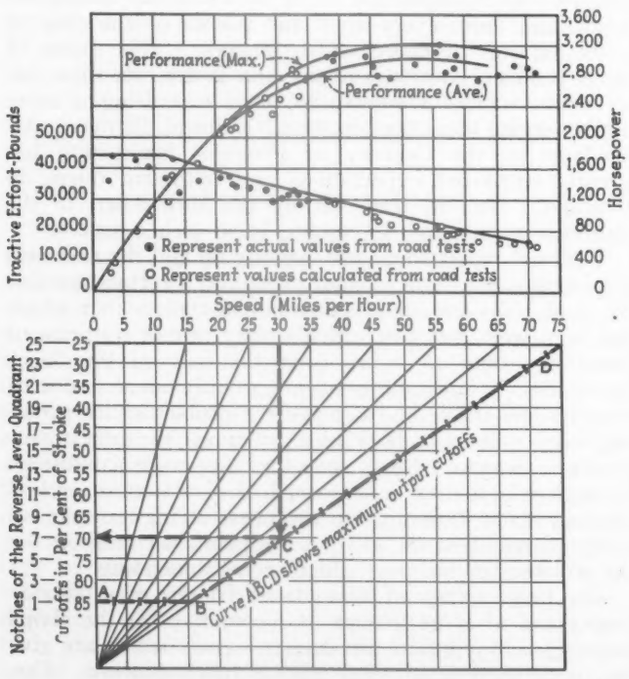


Chart showing cut-offs and reverse-lever positions required for maximum power production

scale down to *C* on the curve *ABCD* showing such cut-offs and thence horizontally toward the left to the desired cut-off shown by the scales at the left of the chart to be in this case 70 per cent, obtained by the use of the seventh notch of the reverse-lever quadrant.

The universal practice is to start a locomotive under heavy load by the use of the maximum cut-off, that is, with the reverse lever in the first notch as indicated at *A* on the chart. As speed accelerates, this maximum cut-off is maintained for a time, as indicated by the horizontal portion *AB* of the curve. But, how long should the use of this maximum cut-off continue? Or, quoting your editorial "How long should the reverse lever be allowed to remain 'in the corner?'" At what speed should it be moved from the first notch?

These appear to be exceedingly simple questions, but it is difficult indeed for enginemen to answer them satisfactorily, if at all. Ask one or several enginemen. Record and compare their definite answers and then consider the fact that for desired performance, railroads are absolutely dependent upon the unobserved and generally unrecorded action which they, and no one else, must take with the reverse lever an innumerable number of times upon each of their trips. Without mechanical aid, much is unfairly and unreasonably expected of them.

A chain is no stronger than its weakest link, and the striking weakness in this last link of cut-off selection, at the end of a chain beginning with the expensive provision of the best power plant which concentrated engineering skill is able to produce, must be apparent.

For any given locomotive, the speed at which the reverse lever should first be moved is a very definite one and for the particular locomotive represented in the chart, it is 15 m.p.h. The movement of the reverse lever from the "corner" at any other speed, will result in an unnecessary loss of possible power development. This loss must usually be significant and will frequently spell the difference between success and failure in the maintenance of schedule or desired running time, or a failure as serious perhaps as an expensive stall. Enginemen cannot take even the first step in cut-off adjustment properly without a definite knowledge of the speed at which it should be taken, and that speed is usually unknown not only to the engineman, but to mechanical officers generally. Even assuming that it is known, how can the engineman tell just when his engine has attained that particular speed, which may be reached and passed in a single instant, possibly when an injector is breaking and requires attention, when some lubricator adjustment must be made. a signal observed, or what not.

Moreover, this question presents another problem which the engineman is little qualified to solve. He cannot solve it alone and unassisted although he may be disposed to exert every possible effort in the necessary thinking and although he may have the time to act, we certainly cannot reasonably depend upon obtaining the desired results.

One interested in mechanical means of effecting cut-off selection has recently said to me that "the situation with regard to automatic cut-off control is simply one of its business aspects. The railroads have not appeared ready for it. I am not sure that they are ready for it yet. I do not mean to say that they do not need it, but I do mean to say that more people in railroad service must arrive at a more definite appreciation of the need and I do not know just how such a situation is to be brought about." Your editorial which inspired my thus writing upon the subject must contribute significantly to the removal of the above cited difficulty by stimulating thought and the development of a more wide-spread appreciation of the need. The American Railway Association, Mechanical Division, recognized this situation in the last (1932) report of its locomotive construction committee, but a large amount of educational work is needed in order that a larger number of railroad men may be led to understand the value of accurate and precisely timed cut-off selection.

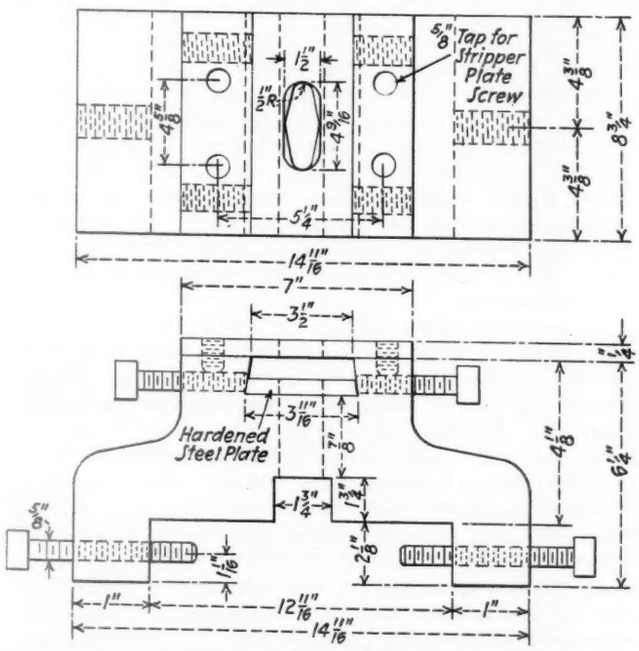
B. B. Milner.

With the Car Foremen and Inspectors

Reclaiming Retainers With Broken Lugs

By A. Skinner

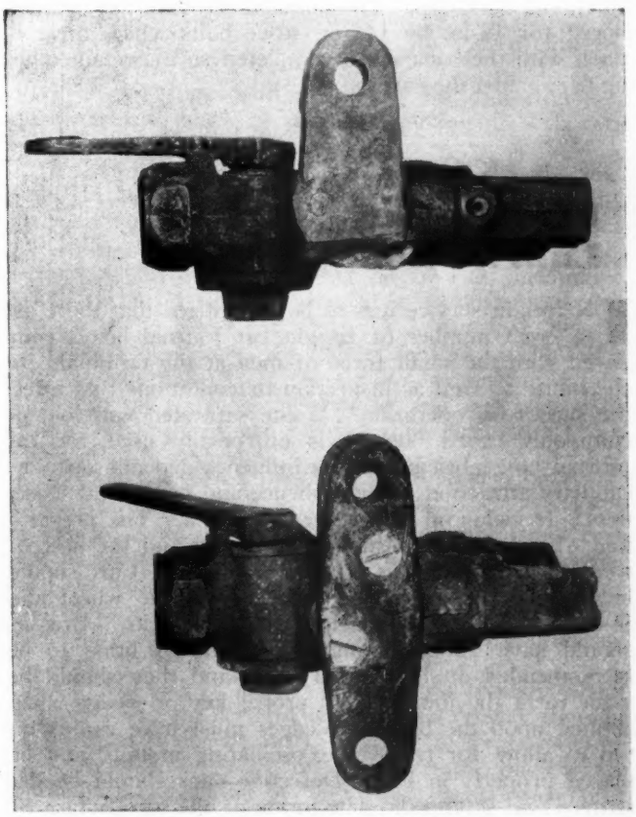
WHEN air-brake pressure-retaining valves are removed for repairs, the lugs are sometimes broken and, in this condition, the valves are useless for further service. The die, illustrated, may then be used



General design and dimensions of a die used in making new backs for retaining valves with broken lugs

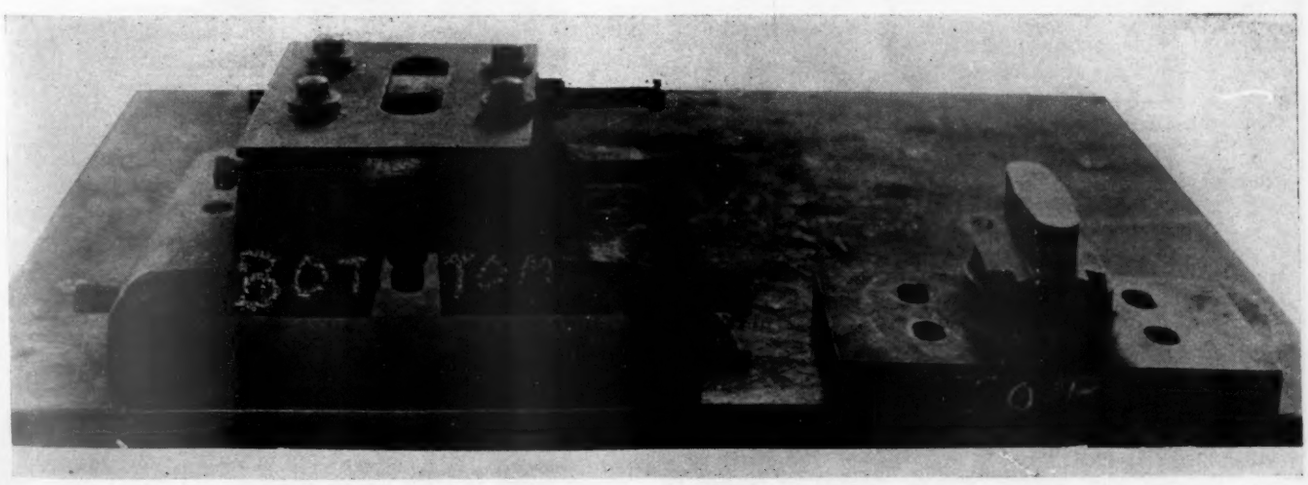
for punching out new backs or lugs which are applied with two countersunk-head bolts.

The new backs are made of 3/16-in. scrap boiler steel, cut to 3 in. wide and left at the original length, whatever it may be, so that as many backs as possible can be punched without removing the material from the die.



Retaining valve with broken lug (above); how it looks after being repaired (below)

The drawing gives all information necessary for making the die and also indicates the principal dimensions of the punch. One of the pictures shows the die and the punch



The die and punch used in punching retaining-valve backs from 3/16-in. stock

resting on a bench and the other a retainer, before and after the back is applied.

The general procedure is to use this die at some central repair point supplying shops along the line through the stores department. Thus, only one die will be necessary.

The backs can be made for 12 cents each, 700 being punched out by one man in an 8-hr. day. Considering the cost of the retainer, which is $4.17, the die would pay for itself in a short time.

When applying the back to the retainer, it is clamped to the back of the valve and holes drilled through the flange and the valve body. Then, after removing the clamps the holes in the body are tapped with a ½-in 21-thread hand tap. The holes in the back are counterbored for ½-in. by 1½-in. stove bolts which must be flush with the back when completed so the retainer will lie flat against the car.

Freight-Car Lubrication*

IN freight service it is to be recognized that there are a great number of freight car journal boxes compared with the small force of men at the terminals for the oiling as well as inspection of conditions that affect the successful operation. Waste saturated with oil, or commonly called "dope," is universally used for car journal box lubrication. Its influence depends upon its capillary attraction, with resilience and permanent looseness. It yields oil only after saturation. The preparation of the journal bearing is exacting and the best of workmanship and tools are none too good. Care should be exercised in handling wheels, from the wheel and journal lathe to the placing under the car. Brasses should have smooth linings, broaching of brass to be recommended on high-speed work and they should be made to fit the journal with proper key or wedge when applied upon the brass. Wedges must have radius on top to allow for transverse, oscillating motion, and be placed properly in box. Defective ones should be destroyed and scrapped. The inside of the top surface of box should be examined for a level wedge seat.

* From a paper by Roy W. Hunt, fuel supervisor, Atchison, Topeka & Santa Fe, Los Angeles, Cal., presented before the April, 1933, meeting of the Pacific Railway Club.

In free oiling there should be a distinction between the necessary thorough saturation to that of being soaked. In applying waste to box it should not be obstructed, clogged, pressed or fixed too firmly into the box—the result of which, if done, is a glazed surface on the packing. Proper feeding of a desirable grade of oil gives the necessary lubrication. Special attention should be given to freight equipment handling unusually heavy loads; also, to fast schedules and to unusual weather conditions. Passenger car records, however, indicate that they are oiled too much.

On inspection of equipment, feel the boxes with the bare hand on top, back of lid. If open box inspection is made, observe the center of the journal which, if dry, indicates a probable heated bearing. Examine as to cause, which might also be indicated by a graphite-like appearance at end of journal or on top of packing. This also may denote age. Use a packing iron in placing packing against fillet of journal and press it away from the brass and down at end under collar of journal. American Railway Association standard method for the packing of boxes should be followed, namely: Back roll loosely prepared for freight and also for passenger equipment; this to be prepared in oil house and soaked before putting in boxes. Packing under journal to be placed in a continuous strand in boxes. In engine cellar boxes it should be applied in a mass. This gives each waste strand a connection or contact with the journal surface as well as the bottom of cellar. Do not add a little packing to the top of "dope" already applied. The use of proper tools and cleanliness in operation are absolutely necessary.

Report as to dry packing is a result and not cause of hot boxes, while overpacked boxes are most dangerous, as they invite waste grabs or wipers. The packing should be placed well below the center line of the journals. Attention should be given to oil boxes and bolts, the truck springs and bolster fitting in the truck, especially when applying new wheels. Care should be exercised in seeing that the interior of box is free of scale and other foreign substance. The packing should be removed before jacking up and "dope" buckets used, which should be handy for the receiving of packing removed, separation being made between the thick, dirty wads and short string packing with that of loose and clean packing. The latter can be used with new packing in preparing the box for service, the remains being returned for renovating. A failure of bearing suggests

Journal-box packing receiving attention at an important freight-car inspection point

that there has not been a regularity or frequency in the repacking and inspection. Sensible economy should be followed.

The prevention of hot boxes can be materially reduced by intelligent and systematic effort by those handling this class of work. Hot boxes may be divided into those which run cool after repacking and those that do not—either of which might be eliminated with careful workmanship and rigid inspection and constant vigilance in maintenance. Use of water is to be discouraged. Its only function is to cool and if cooling is done quickly the outside cools and inside, being hot, results in chill cracks or a ruined bearing surface. If water is used for cooling the brass should be removed; otherwise, it will be cracked or broken. If packing is water-soaked it should be removed and not used until renovated. Other substitutes or relief should be used only in emergency—such as soap, hard grease or pin "dope."

Condition of oil houses is of importance. They should be kept clean and systematic in arrangement. In soaking packing, loosen it before being placed in vats and add enough oil to cover it. Soak forty-eight hours in temperature of not less than 70 degrees Fahrenheit and then drain, using only clean oil. Reclaim packing by either forking it in hot oil or a centrifuge machine. This work should be done at a central point, with utmost care exercised by supervisor. Record being made of the reclamation should give a clue to the quality of waste and also as to method of preparation in case of excessive hot box trouble. This also affects oil costs and repacking while in service.

Delays to Loaded Cars in Transit*

RECENT studies have revealed that the substantial losses created by the shopping of all types of loaded freight cars in transit, by reason of inadequately conditioned running parts, surely warrants greater activity for better conditioning of such items. This opinion is based on investigations which indicated that at least 1 of each 45 cars had to be placed on receiving lines' shop tracks for repairs immediately after having been received from connecting lines within the Chicago territory, with some roads ranging downward to 1 of 22. This does not include the loaded cars shopped for repairs by loading carriers, or at other than interchange points, which probably exceeds the number shopped in interchange.

This, no doubt, reflects general conditions throughout this country, and, taking into consideration the fact (1) that 46 million cars were loaded with revenue freight in the United States during the reasonably normal year of 1930; (2) that the average delay per car is 18 hours; (3) that the average cost, based on studies made in 1930, of moving a car to and from a repair track was $4; (4) that the average claim per loaded car probably exceeds $2.50; it is an easy matter to decide that the total loss is tremendous.

Bureau's Study Extended to Causes of Delays to All Loaded Cars

With a desire to improve this condition, the General Managers' Association of Chicago decided to have its car interchange bureau function in connection with this problem along the same lines as with perishable loads, with the addition of having bureau representatives inspect the defective material removed from all loaded cars placed on shop tracks immediately after having been received from connecting lines within the Chicago territory, and making reports of conditions found to officers who are in a position to assist in improving the situation.

Such action, it was thought, would have a tendency to:

(1) Create greater effort towards having cars selected for loading that are in suitable condition to carry loads to destination without requiring repairs in transit.

(2) Bring about a better understanding between carriers and private car owners as to the nature of "running defects" on account of which loaded cars are being shopped.

(3) To ascertain whether or not the condemnation of the material which caused the shopping of such cars is warranted.

The first month this plan was in effect revealed that 41 per cent of the loaded cars were of private ownership, that 30 per cent were owners' cars loaded on their own rails, and that 21 per cent had been loaded in the Chicago territory. The defects existed on 69 per cent when loaded and on 31 per cent prior to being placed in trains for delivery to connecting lines. While it was thought that quite a number of the defects existed on the latter when loaded, we allowed for the doubt, making it safe to say that the above is conservative, and that at least 75 per cent of the cars are being loaded with defects requiring repairs en route.

The defective items found on the 39,629 loaded cars shopped in the Chicago territory during the year 1932 are shown in the table. It was found that many cars were placed on repair tracks for the purpose of renewing items which could easily have been performed in the train yards, thereby eliminating the expense of switching them to and from the shop tracks, as well as eliminating the delay.

Additional delays and expenses were brought about by specializing on certain items, which it was thought was principally due to overly-exacting instructions emanating from various accidents. For example, cases where derailments are caused by failure of journal-box bolts, resulting in instructions being issued to the effect that loaded cars must positively not be allowed to go forward until such bolts are absolutely tight, making no distinction between steel truck sides secured to journal boxes with bolts and arch-bar construction.

Care Needed in Issuing Instructions

While I do not intend to infer that chances should be taken in running cars with dangerously loose or defective parts, I have been convinced that many thousands of dollars can be saved by exercising greater care in the wording of instructions so as to permit the men to whom they are directed to use their own best judgment in deciding whether or not it is safe to defer such repairs until after the cars have been unloaded.

There is no doubt in my mind but that more frequent studies on the part of the higher mechanical officers of the various parts renewed under loaded cars and favoring the supervisors in direct charge of repairs with constructive advice regarding judgment defects would be well worth while, which would also prove true in connection with defects for which the American Railway Association has prescribed limits of wear.

I voice the opinions of a number of mechanical officers by stating that carefully-worded instructions could safely be issued to permit wheels, having just reached condemning limits, to remain under cars until they are

*Abstract of a paper presented by C. J. Nelson, superintendent of interchange, Chicago Car Interchange Bureau, before the regular monthly meeting of the Car Foremen's Association of Chicago, held Monday evening, April 10, Auditorium Hotel, Chicago.

unloaded, particularly so in cases where the defects in connection with which a liberal margin of safety has been allowed consist of worn flanges, seamy rims, broken rims, etc. It is quite possible that the Committee on Wheels of the American Railway Association would be glad to assist anyone in deciding as to the kind of wheel defects which could be so handled with safety. It would probably also be consistent to provide reasonable elasticity in connection with the removal of the brake heads, hangers, pins, bolts, etc., specified in A. R. A. mechanical rule No. 63. The shopping of loaded cars for the renewal of these items has increased to no small extent since definite limits of wear were established, and, until such time as special efforts are made to renew them on empty cars, it would, no doubt, be economical to refrain from being overly exacting when found worn to or slightly beyond the condemning limits on loaded cars.

Proper Selection of Cars for Loading

The fundamental problem, however, is to provide and select cars in proper condition for loading, but I fully appreciate how difficult this is to solve. What the effect would be if the inspection of empty cars were equally as rigid as the inspection of loaded cars is problematical, but it is pretty safe to prophesy that such action would soon create a situation to verify the fact that it would be desirable to apply the present limited appropriations towards repairing the "running defects," and set aside the cars requiring heavier repairs for the time being. While I agree that the so-called "cycle repair plan" is ideal, I believe that greater efforts should, at all times—especially so in times like the present—be made towards better upkeep of the "running defects" which usually are not acceptable on cars under load.

To bring out more clearly what I have in mind, I will again use the journal-box bolts as the example by stating that if loaded cars are not considered safe to handle with these bolts loose, then it would seem logical to keep

Defective Parts on Loaded Cars Shopped in the Chicago Territory during 1932

	Per cent
Wheels	31
Brake beams or attachments	15
Brakes cleaned account old dates or being inoperative	10
Journal bearings	6
Column and journal-box bolts	7
Truck springs	5
Couplers, yokes, yoke rivets and draft-gear parts	9
Safety appliances	6
Miscellaneous, such as truck sides, arch bars, bolsters, underframe defects, spring plank, side bearings, train lines, door defects, about 1 per cent each, or a total of	11

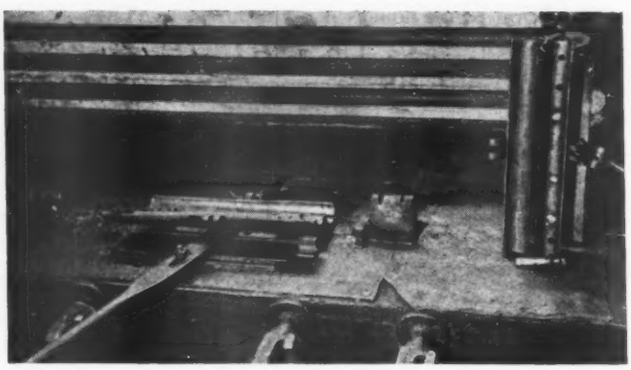
a sharp lookout for them on empty cars, with the understanding that they must not continue in service until they have been tightened or renewed, also applying the same policy to all similar defects which are generally ignored on empty cars.

It is a well-known fact that there is a marked difference between the inspection and disposition of empty and loaded cars, that empty cars, as a general rule, are not cut out for repairs if at all safe to handle, and that many of the defects passed up on empty cars are immediately condemned when found under loaded cars. The desired remedial action would, of course, be to treat the empty cars exactly the same as the loaded cars, at least so far as running defects are concerned, with the possible exception that the same tolerance allowed to get loaded cars to destination with deferred repairs should not apply to empty cars.

It can hardly be expected that such a revolutionary procedure will be attempted all at once, but I am wondering if it is not high time to begin gradually functioning toward that goal, and at the same time giving more serious consideration towards retiring cars which, although they may be in perfect physical condition, are not designed for the high speed of today, which, no doubt, will be increased as time goes on. The fact that the amount of freight equipment far exceeds present-day needs makes it apparent that efforts along these lines would not be out of order.

Mounting Air And Signal Hose

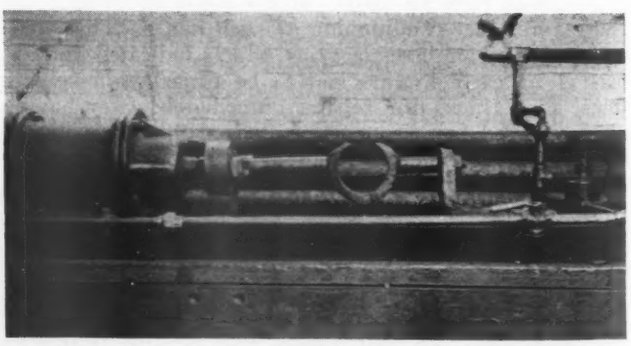
AIR and signal hose can be quickly mounted on the heads by the device, shown in one of the illustrations open ready to receive the hose and head. The head is placed on the notched plate on the right; the hose is laid in the split cylindrical portion in the middle and the



Device for mounting air or signal hose and fittings

hinged top half closed and secured by a clamp engaging the lug. The threaded connection is placed on the pin at the left. The inside of the tubing and the nipples are coated with rubber cement and a movement of the lever first forces the tube onto the nipple at the left and then onto the nipple of the head at the right.

The hinged split cylinder for mounting signal hose is



Special air-operated, hinge vise used in applying hose-clamp bolts and nuts

shown standing on end at the right of the picture. This is interchangeable with the holder for the air-hose tubing previously described.

In front of the bench are located "Go" and "No Go" gauges on which the heads are tested before being mounted on the hose.

An old air-brake cylinder is used to operate a press for applying clamps to air and signal hose. The hose clamp is pressed together by the points of the hinged vice, illustrated, the bolt and nut then being readily applied and tightened. A regulator valve is placed in the air supply line to limit the pressure applied to the clamp.

Car Cleaners Utility Ladder

THE ladder shown in the illustration is provided with a container at the top in which can be stored all of the equipment that an outside car cleaner requires in the performance of his duties. This is especially true of those car cleaners assigned to cleaning coach windows. Sponges, pumice and polishing cloths can be kept in the

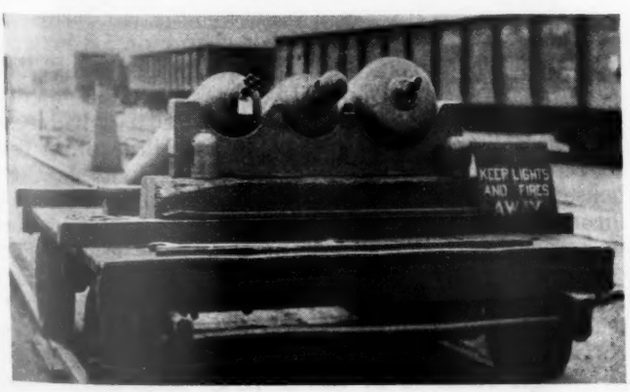
The box at the top of the ladder contains the cleaner's supplies

container and each car cleaner can distinguish his own equipment by identifying their ladder.

Steel V-shaped supports are attached to the bottom of the ladder to prevent slipping. A piece of carpet or plush is applied to the top of the ladder, where it rests on the side of the car in order to prevent damage to the varnish.

Portable Truck For Gas Tanks

ON the smaller rip tracks, where oxygen and acetylene gas are not piped to outlets along the track, tanks must be used. Unless the rip track can boast of



Rip track welding jobs are simplified by using this truck

concrete between the track centers it is difficult if not impossible for one man to push these tanks from car to car, regardless of the type of wheel with which his conveyance is equipped.

The average rip track consists of one or more long tracks with a supply track between them. A four-wheel truck similar to the one shown in the photograph will make an ideal conveyance for the cutting torch operator. Usually it takes from two to four tanks of oxygen to use up one tank of acetylene gas. The truck in the illustration is fitted to carry two or more tanks of oxygen making it unnecessary for the operator to stop his work and change tanks at any time during his period of duty. He can also move the outfit from car to car without any assistance.

Both the oxygen and acetylene tanks should be elevated at the top to prevent the liquid from escaping through the discharge valve and as shown this can be taken care of by cutting three or four crescents in a suitable size timber and bolting it to the floor of the truck.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. R. A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Wages of Watchman Involved in Transfer of Lading

CONX car 1505 containing casinghead gasoline was set back from the Denver & Rio Grande Western to the Union Pacific at Denver, Colo., September 4, 1931, because of leaking contents. The car was set back by the chief joint inspector in error. Subsequently the car was moved by the issuance of a transfer order in favor of the Union Pacific and the chief joint inspector in his reply to a request for defect card protection wrote the Union Pacific in part as follows: "Transfer authority, which was issued to your company, is authority to bill the D. & R. G. W. for all expenses incurred in the transferring of this lading." There was no insulated tank car available for immediate transfer of lading and the Union Pacific subsequently secured another insulated tank car, CONX 1513, and transferred and forwarded the shipment on September 7, 1931. During the interval between September 4, 1931, the date the car was set back and September 7, 1931, the date the car was transferred and the shipment forwarded, the Union Pacific had an employee in constant attendance to watch the car and empty the vessels which had been placed to catch the gasoline leaking from the tank through the outlet valve, and in rendering its bill included a labor charge to cover the wages of employees engaged solely in watching this car. The D. & R. G. W. in its statement objected to the wages of the watchman while serving as a guard being included as a part of the direct labor cost for transferring the contents of the car, on the ground that such service is generally recognized as a necessary precaution to prevent explosion or fire damage to property; therefore, a safety measure that would be taken by any railroad under similar circumstances and that such wages are usually charged to the proper account and considered a part of overhead expense. It further contended that while there is an I. C. C. rule in freight tariff No. 2 stating that a watchman should be used to guard leaky tank cars while under load, at the same time the I. C. C. classification of accounts lists wages of watchmen and policemen as

chargeable to shop expense. The Union Pacific in its statement pointed out the fact that there being no other suitable car in that district for loading at the time, it was necessary, by reason of the condition of the leak, to place in constant attendance someone competent to handle the situation if the leaks became worse, to empty the vessels and prevent loss of contents as far as possible, as well as to warn and guard against the hazard of fire and explosion. Under the circumstances the Union Pacific believed that it was unreasonable to assess it for the expense involved as the result of an error made by the D. & R. G. W. in setting back the car.

The Arbitration Committee, in a decision rendered November 4, 1932, said that: "Interchange inspection of CONX tank car 1505 moving from the Union Pacific to the Denver & Rio Grande Western showed no leaky condition. Inasmuch as car was returned in error to the Union Pacific because of a leak and A. R. A. transfer authority against the D. & R. G. W. was accepted by the Union Pacific without any agreement as to additional expense for policing the car, the charge should be confined to the direct actual labor and material expense of transferring the commodities, plus 25 per cent, in accordance with section (g) of Rule 2."—*Case No. 1712, Denver & Rio Grande Western vs. Union Pacific.*

Settlement for Destroyed Car

Atlanta, Birmingham & Coast car No. 30148 was damaged March 14, 1929, in an accident on the Norfolk Southern. The A. B. & C. claimed that the Norfolk Southern should pay for the rebuilt value of this car while the Norfolk Southern claimed that it should pay only for the value of the car as originally built. On April 8, 1929, the Norfolk Southern, in advising that the A. B. & C. car had been damaged, requested depreciated value statement covering the car. The A. B. & C. showed a depreciated value of the car in question as originally built of $339.11, with a notation to the effect that "If it is definitely decided in their favor by the A. R. A. concerning the rebuilt value of the above car under statement No. 1 A. R. A. Rules revised 1927, effective July 1, 1928, we reserve the right to bill for the difference," after which the A. B. & C. furnished a depreciated valuation statement in amount of $860.11 that would be billed to the Norfolk Southern provided this class of car were recognized by the A. R. A. as rebuilt. Under date of April 25, 1929, the Norfolk Southern advised that no decision concerning this car could be made at that time and knowing that some time might elapse before a decision based upon information furnished to the A. R. A. and the I. C. C. could be made the A. B. & C. wrote to the Norfolk Southern in part as follows: "We have practically withdrawn our request from the A. R. A. for rebuilt value of this class of equipment and unless they arbitrarily decided that the car should be classified as rebuilt, then the original value as shown in my letter of April 11 will stand." The Norfolk Southern stated that it felt that it was optional with the car owner to render a bill in amount of $339.11 in full and final settlement for the car as of date originally built, agree to the car being restored to service at an estimated cost of $450, or hold the matter in abeyance pending a decision of the A. R. A. as to the rebuilt value, which decision was not rendered for more than two years. The bill was rendered for $339.11, payment made and the matter considered closed. However, on July 24, 1931, another bill was made for $521 covering the difference in the value of the car as between the date originally built and the date of rebuilding, payment of which was declined.

The Arbitration Committee on November 4, 1932, rendered the following decision: "When the Atlanta, Birmingham & Coast, as the car owner, advised the Norfolk Southern what the settlement would total ($860.11) in case the car was recognized by the American Railway Association as entitled to settlement on rebuilt car basis, the Norfolk Southern replied that it would be necessary to await the decision of the Association regarding claim for rebuilt recognition before it could determine on settlement. The car owner then advised the Norfolk Southern it had practically withdrawn its request for A. R. A. rebuilt car recognition and urged that the bill be authorized in amount of $339.11, in settlement on basis of original date built. In response thereto the Norfolk Southern authorized bill for $339.11, stating that same was in view of owner's withdrawal of rebuilt claim and on the basis the matter would be considered closed on payment of said amount. In view of car owner's acceptance of settlement for $339.11, under the condition stipulated, the contention of the Norfolk Southern is sustained."—*Case No. 1714, Atlanta, Birmingham & Coast vs. Norfolk Southern.*

Responsibility for Betterment Charge on Wheels

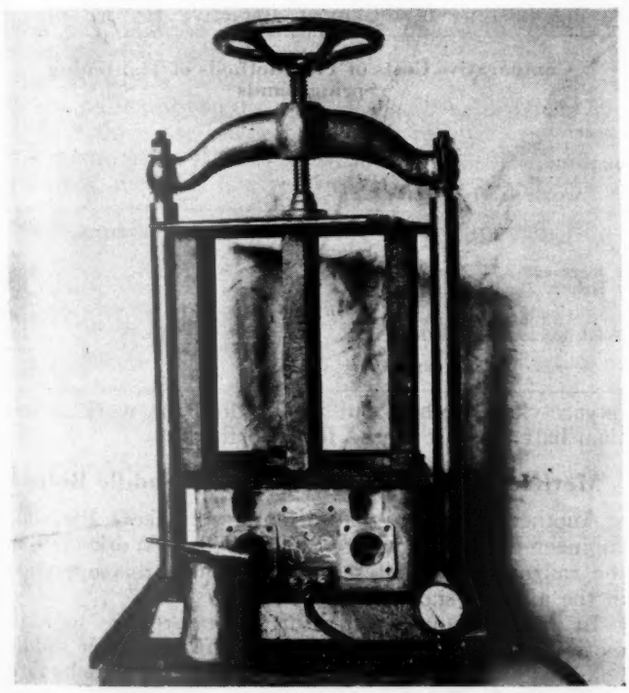
The Kansas City Southern applied one pair of second-hand wheels to Texas & New Orleans car 51354 at Kansas City, Mo., June 8, 1931, because of a cut journal and rendered a "no bill" charge to cover. The Chicago, Burlington & Quincy removed these wheels at St. Joseph on November 30, 1931, and applied new wheels in making the repair and rendered a wheel material charge of $13.80 to cover the value of the two new wheels applied, less credit for two second-hand wheels removed. The C. B. & Q. also rendered a labor charge of 5.8 hr., and a material charge of $2.86 for two new solid 10-in. journal bearings and two pounds of wrought iron for four new bottom-rod carrier-bracket bolts. The T. & N. O., using the C. B. & Q. billing repair car as joint evidence of wrong repairs in accordance with Rule 90, forwarded it to the K. C. S. with its billing repair card and requested a defect card to cover wrong repairs in accordance with third paragraph of Rule 80, or, if preferred, K. C. S. counterbilling authority to offset the C. B. & Q. charges. The K. C. S. furnished counterbilling authority in amount of $9.34 to cancel a labor charge of 5.8 hr. and a material charge of $2.86, and declined to cancel the wheel material charge of $13.80 as requested by the T. & N. O. The K. C. S. contended that it had fulfilled its obligation in furnishing counterbill to offset the C. B. & Q. charge for the labor, brasses and bracket bolts, but declined to issue a counterbill for the betterment of the wheels on the ground that it should not be responsible for a betterment charge, as in the case of the new wheels, from which the car owner would receive full benefit. The T. & N. O. contended that the wheels being removed by an intermediate road, the K. C. S. should issue counterbilling authority to cancel all charges rendered by the C. B. & Q. in accordance with Interpretation 14, Rule 98.

The Arbitration Committee in its decision rendered November 4, 1932 ruled that: "The K. C. S. is responsible for the betterment charge in accordance with the first sentence, second paragraph of the answer to Interpretation No. 14 of Rule 98."—*Case No. 1713, Kansas City Southern vs. Texas & New Orleans.*

In the Back Shop and Enginehouse

Testing Rail Motor Car Engines

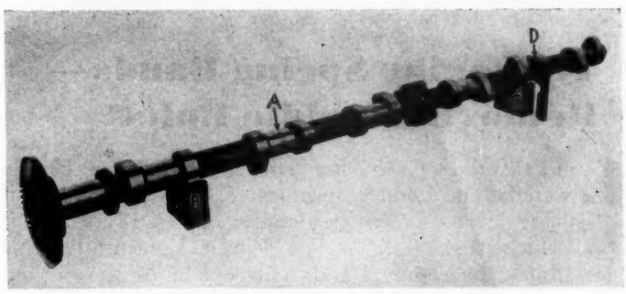
IN the overhauling of gasoline engines used in rail motor cars it is necessary to use several types of gages and devices for testing the accuracy of the repair work that has been done on the parts of the engine. One of the illustrations accompanying this article shows a cam shaft with blocks and gages designed to check the alinement of the shaft and the slope of the cam faces. The V blocks *B* and *C* are placed on an accurate surface plate. One of the tool-steel blocks, *C*, is milled with a 60-deg. V to fit the circular portion of the cam



Leaking water jackets or valves are detected with this device

under which it is placed while the other block, *B*, fits the angle of the cam. Cam surface variations between corresponding cams on opposite ends of the shaft may be readily checked by the use of these blocks preventing the possibility of worn cam surfaces being overlooked and the shaft re-assembled in the engine with a consequent loss of power. The gage *D* is milled so that when it is held against the side of the block *C* the gage surface of *D* fits against the flat of the cam. The use of these three tools in combination permit the complete checking of a cam shaft.

The other illustration shows a sectional cylinder head being tested for water-jacket leaks in a shop-made testing device. The cylinder head is placed in the testing press and a steel plate with a rubber gasket is placed on top of the cylinder head and the press tightened down making a perfect seal. The steel plate is bored out to cylinder diameter permitting inspection of the combustion chamber surfaces at the same time. Air under about 30 lb. pressure is forced into the water jacket through the discharge port after the head is painted with soap suds. Any leak will of course show bubbles. This apparatus is also used for testing out the tightness of the valves in the seats by blocking off the intake and exhaust ports



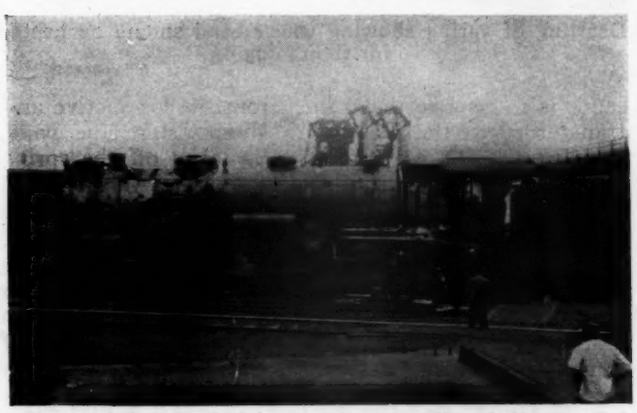
Fixtures for gaging the relation of cams

and running two pieces of rubber hose from these ports to a container of water. Air is forced in the spark plug holes at 90 lb. pressure and any air escaping by the valves will pass through the hose and be shown by the bubbles escaping through the water. The wood blocks shown are used as spacers to allow more room for inspection.

Re-railing a Locomotive

THE illustration shows a modern 4-6-4 type locomotive of the Chicago, Burlington & Quincy which was derailed in the Chicago district and then put back onto the tracks again by means of special jacks, using air supplied from the locomotive reservoirs.

This locomotive, weighing 210,000 lb. on the drivers, was derailed on a curve, all driving wheels and trailer



Re-railing a locomotive with air jacks

wheels leaving the track. To have put the locomotive back on the track again with an ordinary re-railer would

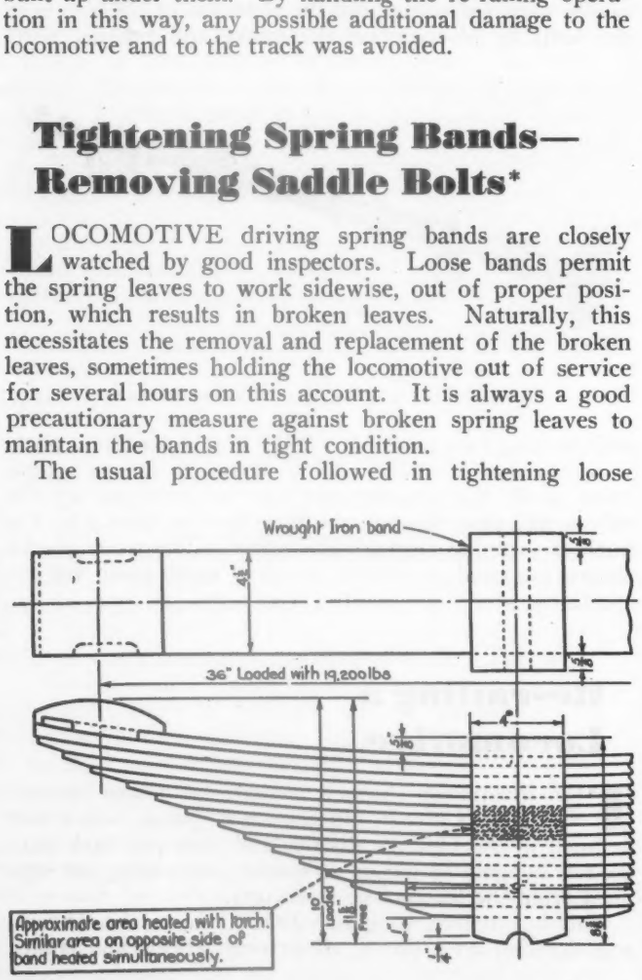
have necessitated pulling the locomotive either forward or backward over the re-railers, with the result that considerable damage would probably have occurred to the track structure and possibly to the locomotive itself before it was finally returned to the rails.

At the Western Avenue enginehouse of the Burlington, two Duff-Norton 75-ton power-operated jacks were available, having pneumatic motors permanently built into the jack structures and operated with compressed air. By properly placing the jacks and coupling them through a suitable hose to the air reservoirs, one pair of wheels was raised at a time so that the track could be built up under them. By handling the re-railing operation in this way, any possible additional damage to the locomotive and to the track was avoided.

Tightening Spring Bands—Removing Saddle Bolts*

LOCOMOTIVE driving spring bands are closely watched by good inspectors. Loose bands permit the spring leaves to work sidewise, out of proper position, which results in broken leaves. Naturally, this necessitates the removal and replacement of the broken leaves, sometimes holding the locomotive out of service for several hours on this account. It is always a good precautionary measure against broken spring leaves to maintain the bands in tight condition.

The usual procedure followed in tightening loose


Wrought Iron band
36" Loaded with 19,200 lbs
Approximate area heated with torch. Similar area on opposite side of band heated simultaneously.

Drawing of spring showing where band should be heated for tightening

bands is to remove the spring from the locomotive and transfer it to the blacksmith shop. Here the band, usually made of wrought iron, is taken off the spring and heated in the blacksmith forge fire. When raised to proper temperature, the band is forged to reduce slightly the height of the opening for the spring leaves. While still hot, the band is put back in position on the spring leaves and cooled rapidly with compressed air or water. Rapid cooling is essential to prevent deep heat penetration in the spring leaves, which would damage their temper. Compressed air is the best cooling agent but water may be substituted where carefully applied. The contraction of the band in cooling enables it to hold the spring leaves tightly again.

An improved method of tightening spring bands has been developed, in which the heating is accomplished with oxyacetylene torches. After removal from the locomotive, the spring is placed under a hydraulic hammer, with the hammer head brought down firmly on the top of the band, holding it in position under pressure. The spring leaves are not removed from the band. Two welding torches with the largest tips available are then put to work simultaneously on either side of the band, heating two horizontal strips about 2 in. wide all the way across the band at the center, as shown in the accompanying illustration. When the strips are heated to a bright red color, the band is administered a few light blows with the hammer. This upsets the band metal in the heated area and shortens it. As the heated strips contract in cooling, the band grips the spring leaves tightly.

Here again precaution must be taken to prevent the heat from penetrating deeply into the spring leaves. This is accomplished by using large tips to heat the strips on the band as quickly as possible and by cooling immediately after hammering, with compressed air or water used sparingly.

The table of comparative cost data shows that the saving in time is the most attractive feature of the oxyacetylene method, but it also does the work at less than half the cost of the forge method.

Comparative Costs of Two Methods of Tightening Spring Bands

Oxyacetylene Method	
Labor:	
2 Operators, 1/6 hr. ea. at .72	$ .24
Material:	
Oxygen, 30 cu. ft. at $1.00	.30
Acetylene, 30 cu. ft. at $2.50	.75
Total	$1.29
Forge Method	
1 Blacksmith, 2½ hrs. at .72	$1.80
1 Helper, 2½ hrs. at .50	1.25
Total, forge method	$3.05
Total, oxyacetylene method	1.29
Saving, oxyacetylene	$1.76

Method of Removing Locomotive Saddle Bolts

Another operation that oftentimes bothers the shop engineer is the removal of saddle bolts. Work done in the railroad field will serve to simplify this operation in the average shop.

In making running, light or general repairs to locomotives, it is often necessary to remove cylinder saddle bolts. On running repairs, broken saddle bolts are renewed. On light repairs, a section of smoke box may be replaced or perhaps an entirely new one installed, requiring the renewal of part or all of the cylinder saddle bolts. When general repairs are made to a locomotive, in some of the large modern shops the boiler is entirely removed from the frame and transferred to the boiler shop for necessary repairs, in which case all cylinder saddle bolts have to be replaced. In any of these cases, the removal and replacement of these cylinder saddle bolts is a difficult task.

Three methods are commonly employed for removing locomotive saddle bolts; (1) by stretching the bolts, (2) by using the standard oxyacetylene cutting torch and (3) by a combination of oxyacetylene cutting and oxygen lancing.

To stretch the bolts, the nuts are tightened down until the metal is actually stretched, thus reducing the diameter of the shank and making the removal of the bolt from the hole comparatively easy. This method takes considerable time, however, and is expensive.

By the cutting-torch method, the heads and nuts of

* From an article by F. L. Huggins, Air Reduction Sales Company, New York, published in the June issue of Industry and Welding.

the bolts are burned off, after which the shanks of the bolts are burned out of the holes, using a standard cutting tip. An experienced operator can burn out the shanks successfully by this method, but inexperienced operators may destroy many cutting tips and waste much time and gas in attempting to practice it.

The most economical and by far the quickest method is the one utilizing both the cutting torch and the lance. By this method, only the bolt heads are burned off, from the cylinder side, using a standard cutting tip. A welding torch is then employed to heat one of the bolt shanks sufficiently for the lance to begin operation. Less than a minute is required for the lance to remove a bolt.

A very simple type of lance, which has proven itself efficient for the work is used as a cutting torch attachment. It consists of a ¼-in. standard pipe coupling, brazed to a cutting tip nut, and a 14-in length of ¼-in. pipe threaded at one end to screw into coupling. A spark plug gasket is used on the tip nut, to prevent leaking of oxygen when the nut is screwed firmly in the cutting torch head.

The lance is operated with approximately 40 lb. per sq. in. oxygen pressure and removes the saddle bolts quickly. About 12 in. of the ¼-in. pipe is consumed in removing each bolt, the remainder being rejected and replaced with a new 14-in. length in a few seconds. Hence, as many lengths of pipe should be provided for a job as there are saddle bolts to be removed.

A comparison of costs between the oxygen lance and stretching methods is given in one of the tables. It is evident that the oxygen lance method is by far the quicker and cheaper of the two. The idea is, of course, not restricted to the removal of locomotive cylinder saddle bolts, but can be used to advantage for many similar applications.

Comparative Costs of Two Methods of Removing Saddle Bolts

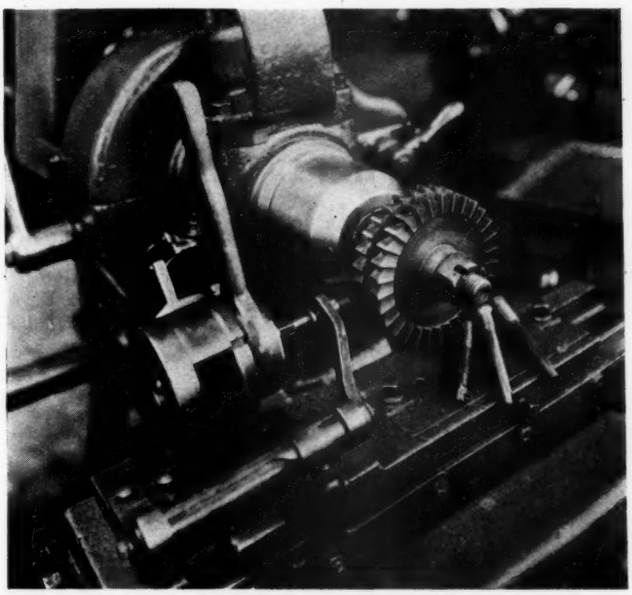
Oxygen Lance Method	
Labor:	
1 Operator, ½ hr. at .70	$ .35
1 Helper, ½ hr. at .50	.25
Total	$ .60
Material:	
Oxygen, 80 cu. ft. at $1.00	$1.00
Acetylene, 10 cu. ft. at $2.60	.26
¼-in. Pipe, 28 ft. at .03	.84
Total	$2.10
Total labor and material	$2.70
Stretching Method	
Labor:	
1 Machinist, 10 hr. at .70	$7.00
1 Helper, 10 hr. at .50	5.00
Total, stretching method	$12.00
Total, lance method	2.70
Saving by lance method	$9.30

A Brass Lathe Attachment

By R. B. Loveland

HERE is an attachment made to slip on the brass lathe carriage in place of the tool post. It is used for milling square ends on small valve stems.

It consists of a T-section of steel with a collet chuck, and a latch to lock it in positions of 90 degrees, with different size spring collets for the various sizes of valve stems. The stop for setting the stems so that each will project the same distance from the collet is arranged with a cam which automatically swings it out of the way of the cutters; also a stop on the cross slide of the lathe makes it possible for each valve stem to be milled back the same distance. An arbor is fitted to the lathe spindle to receive two side milling cutters with a spacer



Square ends on small stems may be quickly milled with this fixture

between them to correspond to the size of the square required.

The illustration shows a valve stem put into the collet up to the stop and tightened. The stem is then milled by moving the work into the cutters while the setting stop is automatically swung out of the way of the cutters.

Protecting Cab Lettering

THE shield shown in the illustration will protect the lettering on locomotive cabs until it is sufficiently dry to permit workmen to brush against it while performing other work around the cab.

The lattice frame protects the lettering until it dries

A latticed frame constructed from yellow pine or other light weight material can be made in suitable length to extend about 12 in., over each side of the lettering

and of sufficient width to protect both the top and bottom of the lettering. A piece of 3/16 in. by ¾ in. iron is fastened to each side of the frame and extends upward sufficient length to hang over the side hand rail or gutter of the cab roof.

The latticed frame permits air to circulate around the lettering and will not deter drying. It also permits the number to be visible.

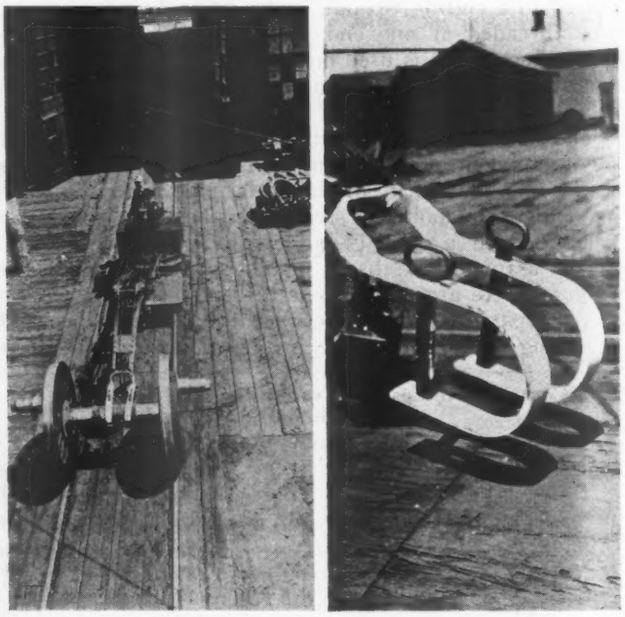
Driving-Wheel Moving Device

THE illustrations show a device which has demonstrated unusual merit in the safe movement of heavy driving wheels by rolling them along the tracks from one shop department to another. As a matter of fact, the device can also be used for rolling wheels over a plank, concrete, or other hard roadway, using the power of an electric crane truck and thus avoiding the hazard of manual rolling. With the larger power now in use and heavy counterbalance, the job of rolling driving wheels, as now handled at many shops and engine terminals, constitutes unusually heavy labor on the part of several men. More or less time is lost in assembling the gang to roll the wheels. The actual rolling is accomplished with difficulty and additional time is required for the men to get back to their other work. But most important of all, from a safety standpoint, is the fact that the unbalanced wheels, after starting to roll, may get out of control and, in making a partial revolution, damage some other piece of equipment or injure workmen who may be standing in the way. This has happened many times.

Former method of rolling driving wheels by manual labor

Safety yoke attached to the crane boom and coupled to the driving axle ready to roll the wheels

Positive control of the rolling of the driving wheels and the elimination of all manual labor in connection therewith is provided by means of a device recently developed by Barry Glen, general enginehouse foreman of the Chicago, Milwaukee, St. Paul & Pacific, at Miles City, Mont. This device consists of a yoke, formed as shown in the illustration and attached to the end of the electric crane truck boom. This yoke is made of stock, approximately ⅞ in. by 4 in., bent at the ends in two half-circles to fit the driving-axle center and equipped with slots to receive two straight steel keys located so as to hold the axle in the yoke with just a small amount of play. These keys are equipped with handles for their ready insertion and removal. The yoke is also designed to be easily bolted to or removed from the boom.



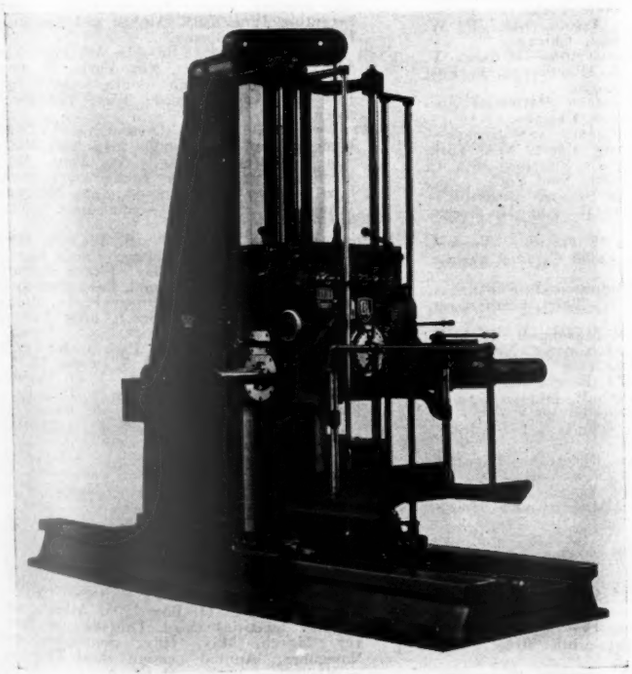
Safety yoke and electric crane truck as used for rolling driving wheels—Close-up view showing yoke details

To use this device, all that is necessary is to attach it to the crane boom, move the truck until the yoke fits over the center of the driving axle, apply the keys and the wheels can then be rolled under the control of the truck operator, thereby making a hazardous job entirely safe. In addition, a labor saving of about 6 to 1 is secured.

RAILROAD UNEMPLOYMENT RELIEVED.—Four hundred railroad men in Los Angeles, Cal., went back to "work" recently as the result of an ambitious production policy by Fox Films. The men, including locomotive engineers, machinists and shop hands—more than 100 of whom had been out of work for months—were hired to man the Union Pacific shops, which served as a location for the filming of a new moving picture, "The Power and the Glory." Each man was paid his union wage in the pursuit, by Director William K. Howard, of authenticity and business-like activity in the U. P. shops. The railroad men, made "extras" for the occasion, were obtained through the agency of the Union Pacific. Each man was assigned a duty by regular shop foremen. Many of the 100 or so who hadn't worked in months, it is needless to say, were more than glad to get the money paid them by the movie company. After first "shooting" a scene of the shops in full operation, Howard directed a vivid strike scene, utilizing his "extras" and the cast of principals headed by Spencer Tracy and Colleen Moore.

Floor Type Horizontal Boring Drilling and Milling Machine

THE Giddings & Lewis Machine Company, Fond du Lac, Wis., has recently added a horizontal boring machine designated as the G. & L. No. 35F to its line of high-power precision horizontal boring, drilling and milling machines. One of its outstanding features is the two spindle idea providing a main spindle of 3½ in. diameter running at speeds up to 500 r.p.m. and a high-speed auxiliary spindle with a speed range up to 1,500 r.p.m. The high-speed auxiliary spindle permits the drilling or boring of even the smallest holes or using the smallest end mills, with a degree of efficiency equal to that obtainable with single-purpose equipment. The lower-speed main spindle used for larger boring, milling and drilling operations is carried by independent bearings so that the original precision alinement is not impaired. Each spindle has 36 speeds and 18 feeds arranged in geometric progression. All speed changes are accomplished by means of sliding gears and jaw clutches through three levers located at the front of the head. A selector lever permits the engagement of one or the other spindle. This same lever also controls the application of the feed to either spindle. The 18 feeds are controlled through two levers with a third for direction. Slow hand feed is applicable to either spindle through a hand wheel at the front of the head. An automatic trip is also provided for throwing out the feed at any predetermined depth within 6 in. spindle travel. Pick-off gears are incorporated in the feed train so that practically any range of feeds or any particular feed is obtainable.



Double spindles are a special feature of this machine

A separate milling feed unit for 18 feeds with directional control is built into the spindle head, permitting the head to feed up or down on the column, or the column to feed back and forth on the runway, in the same direction as the respective lever is shifted, either by feed or rapid traverse. The speeds and feeds applying at any time to spindle or milling units are shown on direct-reading dials. Hand feed adjustment is also provided.

Powerful clamping arrangements are provided for clamping the spindle head to the column and the column to the runway. The operation of the entire machine is conveniently controlled by the operator standing on a telescoping platform. All parts are automatically lubricated.

The motor is placed at the bottom of the column on an adjustable bracket. Bails are provided at the top of the column so the machine can be moved wherever needed.

The entire machine is equipped with anti-friction bearings. It can be furnished with a maximum vertical travel of spindle head on the column of 96 in. and a horizontal travel of column on runway to meet requirements. Safety trips are provided at the end of each travel.

Directional control, which removes all doubt as to the engagement of the proper unit in the right direction, rotary controls for speeds and feeds as indicated on the direct reading dials, a positive safety device for every unit, all combine to reduce the mental and physical fatigue of the operator to a minimum.

Truing Tool for Wheel Dressing

THE Carboloy Company, Inc., Detroit, Mich., has recently announced the development of a new grade, Grade 300, to supplement the two present grades of diamond-impregnated truing tools for finish dressing. With the addition of this new grade, the line of Carboloy truing tools now covers practically the entire range of finish dressing jobs. Each of the grades contains a specific type of diamond with Grade 300 having the best quality stones to accommodate the more difficult dressing jobs.

A further development is the sub-division of each grade into three groups based on the mesh size of the diamond particles used. These are classified as follows:

	Mesh Sizes of Stones		
	Fine	Medium	Coarse
Grade 100	101	102	103
Grade 200	201	202	203
Grade 300	301	302	303

This choice of mesh sizes considerably increases the range of work which can be done by any one particular grade and in many cases enables the user successfully to apply a lower-priced grade than would be possible were only one mesh size available. Similarly, the three grades of stones now available offer opportunities for economies as the user may select the exact grade most suitable for his work, eliminating the necessity of purchasing more expensive stones when less costly ones will do the job satisfactorily.

NEW BESLERS IN TRANSPORTATION.—That the interest of Beslers in transportation continues unabated in a third generation is indicated in reports from Oakland, Calif., where the first successful flight in the history of aviation by a high-pressure steam-propelled motor was recently accomplished by William J. and George D. Besler, sons of W. G. Besler, chairman of the board of the Central of New Jersey. The Besler brothers developed the high-pressure steam motor which was used and which, it is stated, had previously been used successfully in automobiles and rail cars. A feature of the motor is its silent operation, since, the report of the flight stated, William Besler could be heard plainly as he spoke to the crowd from an altitude of about 100 ft.

Among the Clubs and Associations

SMOKE PREVENTION ASSOCIATION.—One of the features of the twenty-seventh annual convention of the Smoke Prevention Association, held at Chicago, June 20 to 23, inclusive, was a two-day railroad session. At the conclusion of its technical sessions, the association elected the following officers for the ensuing year: President, F. E. Trumbull, chief smoke inspector, Buffalo, N. Y.; first vice-president, L. G. Plant, president, Railway Engineering Equipment Company, Chicago; second vice-president, J. P. Morris, master mechanic, Atchison, Topeka & Santa Fe, Chicago; secretary-treasurer, F. A. Chambers, deputy smoke inspector, Department of Smoke Abatement and Inspection, Chicago.

NEW YORK RAILROAD CLUB.—More than 500 members and guests of the New York Railroad Club attended the Club's annual outing on June 29 at the Westchester Country Club, Rye, N. Y. The program of events, getting under way at 10 a.m. with a golf tournament in which there were 256 entrants, continued throughout the day to a closing at the evening's get-together dinner at which trophies and prizes were awarded. The Johns-Manville foursome, composed of R. P. Townsend, C. A. Hodgman, L. R. Hoff and P. D. Mallay, won the team match for the third time and thus obtained permanent possession of the club trophy. L. M. O'Neill was this year's winner of the Brady cup for low net score of all classes. This Brady cup must be won twice by the same player before it can be permanently retained.

FUEL ASSOCIATION.—At a meeting in Chicago on June 16, called for the purpose of electing officers, the International Railway Fuel Association elected the following for 1933-1934: President, J. M. Nicholson, master mechanic of the Atchison, Topeka & Santa Fe, Slaton, Tex.; vice-presidents, W. G. Black, vice-president of the Chesapeake & Ohio, Cleveland, Ohio; C. I. Evans, chief fuel supervisor of the Missouri-Kansas-Texas, Parsons, Kan.; and L. P. Michael, chief mechanical engineer of the Chicago & North Western, Chicago; and secretary-treasurer, T. Duff Smith, Chicago. ¶The Executive committee elected consists of: C. H. Dyson, fuel agent of the Baltimore & Ohio, Baltimore, Md.; T. C. Hudson, general superintendent of the Canadian National, Toronto, Ont.; W. J. Tapp, fuel supervisor of the Denver & Rio Grande Western, Denver, Colo.; J. D. Clark, chief fuel supervisor of the Chesapeake & Ohio, Richmond, Va.; L. E. Dix, fuel supervisor of the Texas & Pacific, Dallas, Tex.; C. Roberts, assistant road foreman of engines of the Pennsylvania, Philadelphia, Pa.; C. T. Winkless, fuel engineer of the Chicago, Burlington & Quincy, Chicago; J. G. Crawford, fuel engineer of the Chicago, Burlington & Quincy, Chicago; J. R. Jackson, engineer of tests of the Missouri Pacific, St. Louis, Mo.; G. Likert, fuel engineer of the Union Pacific, Omaha, Neb.; and W. J. Overmire, fuel engineer of the Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind. ¶The Advisory committee elected consists of: P. E. Bast, fuel engineer of the Delaware & Hudson, Albany, N. Y.; E. E. Chapman, engineer of tests of the Atchison, Topeka & Santa Fe, Topeka, Kan.; J. N. Clark of the Southern Pacific, San Francisco, Cal.; R. Collett, fuel agent of the St. Louis-San Francisco, St. Louis, Mo.; M. A. Daly, chief fuel supervisor of the Northern Pacific, Seattle, Wash.; J. E. Davenport, assistant to vice-president of the New York Central, New York; J. B. Hurley, general road foreman of engines and fuel service of the Wabash, Decatur, Ill.; and T. Duff Smith of Chicago.

Directory

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 2205, 150 Broadway, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY ASSOCIATION.—Division V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I.—SAFETY SECTION.—J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, Room 332, 30 Church street, New York.

MACHINE SHOP PRACTICE DIVISION.—R. E. W. Harrison, 6373 Beechmont avenue, Mt. Washington, Cincinnati, Ohio.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—Edgar J. Kates, 1350 Broadway, New York.

FUELS DIVISION.—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W. Room 411, C. & N. W. Station, Chicago, Ill.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month except June, July and August, Auditorium Hotel, Chicago, Ill.

CAR FOREMEN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth street, Council Bluffs, Iowa. Regular meetings, second Thursday of each month at Council Bluffs.

CENTRAL RAILWAY CLUB OF BUFFALO.—M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

CLEVELAND RAILWAY CLUB.—F. B. Frericks, 14416 Alder avenue, Cleveland, Ohio. Meeting second Monday each month, except June, July and August, at the Auditorium Hotel, East Sixth and St. Clair avenue, Cleveland.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings, fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—R. A. Singleton, 822 Big Four building, Indianapolis, Ind. Regular meetings first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m. Noon-day luncheon, 12:15 p. m. for Executive Committee and men interested in the car department.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—T. D. Smith, 1660 Old Colony building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabasha street, Winona, Minn.

MASTER BOILERMAKER'S ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September, Hotel Statler, Boston.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meeting first Monday each month, except June, July and August, at Minnesota Transfer Y. M. C. A. Gymnasium building, St. Paul.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

RAILWAY BUSINESS ASSOCIATION.—P. H. Middleton (Treas. and Asst. Sec.), First National Bank building, Chicago.

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—C. L. Roberts, R. F. D. 5, Peoria, Ill.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August, Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md. Annual meeting October 17-18, Hotel Stevens, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, July, September and November. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

TORONTO RAILWAY CLUB.—N. A. Walford, district supervisor car service, Canadian National, Toronto, Ont. Meetings first Friday of each month except June, July and August.

TRAVELING ENGINEER'S ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—J. H. Nash, 1101 Peoples Gas building, Chicago. Regular meetings third Monday in each month except June, July, August and September.

NEWS

THE CHICAGO GREAT WESTERN has ordered 500 steel box cars of 50 tons' capacity from the Pullman Car & Manufacturing Corporation.

THE CHICAGO, BURLINGTON & QUINCY has recalled to work a total of 375 men at its Havelock shops for a period of at least four weeks.

THE SOUTHERN PACIFIC has placed 2,952 shopmen on a five-day week basis instead of the three-day week basis that has prevailed during the last two years.

C. B. & Q. Orders Streamlined Train

THE CHICAGO, BURLINGTON & QUINCY has given an order to the Edward G. Budd Manufacturing Company for a high speed three-car articulated streamlined train. The new train is to have a top speed of 120 m.p.h. It will be air-conditioned with mechanical refrigeration and will be operated at one-third the cost of steam transportation. The motive power will be supplied by a 600-hp. Winton Engine Corporation, 2-cycle Diesel engine, a development of the General Motors Corporation of which the Winton Company is a subsidiary. The body of the car will be constructed entirely of stainless steel, electrically "Shot-Welded" by the Budd process, which provides a light, strong and durable construction. The first car of the train will contain the engine and electric transmission, together with a mail and baggage compartment; the second and third cars will be used for passengers. There will be a buffet in the middle car.

An important factor is the light weight of the train, 80 tons, which compares with a weight of 200 to 400 tons for the average steam train of like capacity. It is planned to use this train on long passenger trips across the western plains. Tentative plans call for its operation between Denver and Chicago.

Effective Date of Power Reverse Gear Order Postponed

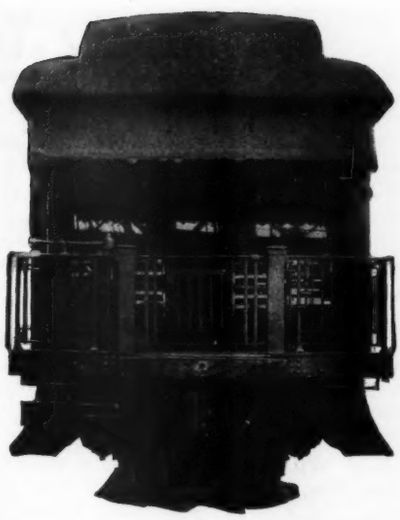
THE INTERSTATE COMMERCE COMMISSION has issued an order postponing the effective date of its order of January 3, requiring the installation of power reverse gear on locomotives, for 30 days after the entry of an order by the federal district court for the northern district of Ohio in the proceedings in which the railroads have sought to have the order enjoined. The postponement was made at the request of the court after the commission had denied a petition of the railroads.

Use of Air-Conditioned and Air-Cooled Cars Increasing

THE PENNSYLVANIA is operating air-conditioned coaches, dining cars, and parlor cars in its New York-Washington service. For this purpose special air-conditioning apparatus has been installed in 91 additional cars which have been assigned to this service. They consist of 35 coaches, 17 smoking cars, 34 parlor cars and 5 dining cars. Sleeping cars are being precooled at all of the Pennsylvania's principal terminals, the same as was done last summer.

All passenger trains in the New York-Philadelphia service of the Pennsylvania also are to be made up with air-conditioned coaches, parlor cars and diners as early as possible. Its Altoona works has already started assembling the necessary materials, and the Pullman Company has begun to equip in a similar manner the necessary additional parlor-lounge cars and parlor cars for this particular service. When these cars for the New York-Philadelphia service are in use, this road will have in operation on its eastern lines over 200 cars in which the temperature is regulated by artificial means. For over a year air-cooled diners have been operated on all the limited trains between New York, Philadelphia, Chicago, Pittsburgh, St. Louis and Washington.

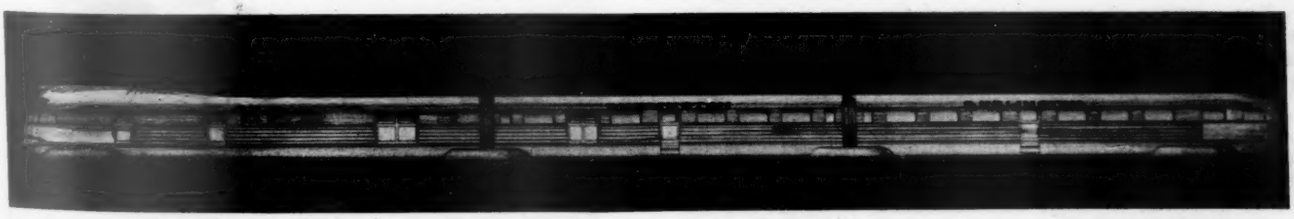
The St. Louis-San Francisco and the Missouri-Kansas-Texas have placed three



air-cooled lounge cars in service on Texas Special trains No. 1 and No. 2 between St. Louis, Mo., Dallas, Tex., Ft. Worth and San Antonio. Each of these was rebuilt and equipped with ice-type air cooling by the Frisco at its shops at Springfield, Mo. The air-cooling system installed is one developed on this road and embodies details of design worked out by its mechanical department.

D. L. & W. Orders Nine Oil-Electric Switchers

THE DELAWARE, LACKAWANNA & WESTERN has placed an order for nine Diesel oil-electric switching locomotives. These were purchased after a 90-day test of their efficiency and of their economy in switching service. Six engines will be built by the American Locomotive Company at Schenectady, N. Y., and three will be built by the Ingersoll-Rand Company at Phillipsburg, N. J. The American Locomotive Company's allotment will be equipped with single unit McIntosh & Seymour engines of 600 hp., while those that the Ingersoll-Rand Company will build will be equipped with two 325 hp. Ingersoll-Rand engines. The General Electric Company will supply the electric equipment for the entire order. The new engines will be used for switching in the passenger stations at Hoboken, N. J., and at Scranton, Pa., as well as for light industrial switching in Jersey City. The Lackawanna's purchase is the first sizable order for railroad power placed in more than a year. Delivery of the engines will be made in the fall. This order includes the one locomotive ordered from the American Locomotive Company and the one from the Ingersoll-Rand Company on approval, as was reported in the April *Railway Mechanical Engineer*.



Proposed C. B. & Q. streamlined articulated train

Supply Trade Notes

THE REPUBLIC STEEL CORPORATION has moved its Dallas, Tex., district sales office to 2322 Gulf building, Houston, Tex.

THE RAILWAY PAINT COMPANY, Chicago, has moved its offices from the Lytton building to 75 East Wacker drive.

THE PERMUTIT COMPANY has removed its general offices from 440 Fourth avenue to 330 West Forty-second street, New York City.

R. B. WILSON, sales manager of the St. Louis, Mo., plant of Joseph T. Ryerson & Son., Inc., Chicago, has been appointed manager of the St. Louis plant.

THE CHICAGO RAILWAY EQUIPMENT COMPANY, Chicago, has moved its general sales office from the Railway Exchange building to Suite 1907, McCormick building, Chicago.

THE ROLLER-SMITH COMPANY, New York, has appointed H. R. Houghton, district sales agent for Maryland, with headquarters at 211 North Calvert street, Baltimore, Md.

THE NATHAN MANUFACTURING COMPANY has moved its Chicago office from 14 East Jackson boulevard to the Railway Exchange building, 80 East Jackson boulevard.

HUNTLEY H. GILBERT, sales manager at Chicago for the Pressed Steel Car Company, has been elected vice-president of the Standard Steel Car Corporation, Chicago.

F. L. JOHNSON has been appointed sales manager, Western district, of the Pressed Steel Car Company, Pittsburgh, Pa., with headquarters at Chicago, to succeed Huntley H. Gilbert, who has resigned.

THE ARTICLES OF INCORPORATION of the Osgood-Bradley Car Corporation have been amended, changing the corporate name to the Pullman-Bradley Car Corporation.

GEORGE W. BENDER has been appointed sales representative of the Union Railway Equipment Company, Chicago, in charge of its northwest territory, with headquarters at St. Paul, Minn.

MORRISON METALWELD PROCESS, INC., Buffalo, N. Y., has moved its Chicago office from its Chicago plant to the Great Northern building, 20 West Jackson boulevard.

W. F. KURFESS, manager of the mill department of Joseph T. Ryerson & Son, Inc., Chicago, has been appointed assistant vice-president of the company. M. J. Hartigan succeeds Mr. Kurfess as manager of the mill department.

THE BUCYRUS-ERIE COMPANY, South Milwaukee, Wis., has acquired the drill business of the Armstrong Manufacturing Company. George R. Watson, formerly president of the Armstrong Manufacturing Company, has become associated with the Bucyrus-Erie Company and is in charge of the drill business.

E. M. HENDRICKSON has been appointed mechanical engineer of the T-Z Railway Equipment Company and the Morris B. Brewster Company, with headquarters at 310 South Michigan avenue, Chicago. Mr. Hendrickson is a graduate in engineering of Kansas State College, Manhattan, Kan., and served six years in the engineering department of the Union Pacific and two years with the Chicago & North Western.

W. J. HARRIS has been elected a vice-president of the American Car & Foundry Company, New York. Mr. Harris will

W. J. Harris

continue in charge of the purchase section of the A. C. F., which position he has held since his transfer to New York from Berwick, Pa., in April, 1920. In 1889, he entered the service of the Jackson & Woodin Manufacturing Company, one of the 13 original manufacturing companies from which the American Car & Foundry Company was formed in 1899.

GEORGE C. ISBESTER has become associated with the Yale & Towne Manufacturing Company, Philadelphia division. Mr. Isbester will have his headquarters in the Railway Exchange building, Chicago, and he will direct the sale of Yale hand and electric trucks and tractors to the railroads in the mid-western territory. Mr. Isbester has for several years been identified with the development of material handling methods and equipment for railway terminals, stores, shops and freight houses. He entered the railway field in 1899, in the mechanical department of the Great Northern, since which time he has been in almost continuous close contact with the railway supply and equipment industry. In 1917, Mr. Isbester entered the navy with the rank of captain, part of the time serving on the staff of Admiral Simms, commander-in-chief of the United States Navy in foreign waters.

H. J. CORNELL, formerly chief engineer of the Transportation Equipment Corporation in charge of automatic locomotive washer installations, is now sales engineer

H. J. Cornell

in charge of locomotive washer installations, of Sperry Products, Inc., Brooklyn, N. Y. Sperry Products, Inc., has recently acquired the exclusive license rights under the Mackin Automatic Locomotive Washer patents. During the past 22 years Mr. Cornell has been engaged in engineering work on many large railroad and industrial design and construction projects.

JOHN R. SEXTON has become affiliated with the Safety Car Heating & Lighting Company, New York, as special agent with headquarters temporarily at New York. His work will be in co-operation with the present sales organization with the major

John R. Sexton

part of his time devoted to a study of the trend of railroad equipment design. Mr. Sexton was graduated from Rutgers University and entered the railway field in 1911. For two years he was associated with the New York Central in general construction work in and about the New York district. In October, 1913, he went to the Erie as resident engineer, remaining with that road until April, 1923, at which time he was regional engineer in the Chicago region. He then entered the supply field as manager of railroad sales for the H. H. Robertson Company, with head-

(Turn to next left-hand page)

IMPROVED MATERIALS WILL LOWER REPAIR COSTS

AT every shopping period, from a quarter to one-third of the original cost of the locomotive is spent for repairs. « Effective control of these expenditures is essential. « When every other economy has been enforced, there still remains the saving in future maintenance that can be had by using modern materials to extend the period between repairs. « Modern boiler tubes of Toncan Iron, due to their superior resistance to corrosion and their uniform quality, far outlast the old tubes. « Modern staybolts of Agathon Nickel Iron have the increased tensile strength required by present-day boiler pressures. They are doubling the mileage per staybolt renewal for progressive railroads. « Firebox sheets of Toncan Iron resist corrosion and fire-cracking. This alloy of refined iron, copper and molybdenum has substantially extended the life of side sheets. « In these and many other instances, Republic metallurgists have developed special alloy irons and steels that are improving locomotive performance and lowering maintenance.

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Staybolts, Tender Plates and Firebox Sheets • Sheets and Strip forspecialrailroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel.

The Birdsboro Steel Foundry & Machine Company of Birdsboro, Pa. has manufactured and is prepared to supply, under license, Toncan Copper Molybdenum Iron castings for locomotives.

CENTRAL ALLOY DIVISION, MASSILLON, OHIO

AGATHON NICKEL IRON

REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO

TONCAN IRON

quarters at Chicago, and later was transferred to Pittsburgh, Pa., as manager of the rail department. In 1929, Mr. Sexton joined Stone & Webster Engineering Corporation, handling the extension of that company's activities into the railroad field.

T. F. THORNTON has been appointed sales manager of the Detroit district, for the Babcock & Wilcox Tube Company, Beaver Falls, Pa. Mr. Thornton will have his headquarters in the Ford building, Detroit, Mich. For many years, he has been connected with the automotive and steel industries, and for the past six years had charge of the sale of tubular products of the Pittsburgh Steel Company, in the Detroit district.

Obituary

WILLIAM A. WILLIAMS, an assistant vice-president in the sales department of the American Car & Foundry Company at New York, died on June 27 at the Post Graduate Hospital, New York, at the age of 64. Mr. Williams had been associated with the American Car & Foundry Company since its organization in 1899.

JOSEPH J. TYNAN, who retired in July, 1932, as vice-president of the Bethlehem Steel Company, with headquarters at San Francisco, Cal., died of heart disease on June 6, at his home in that city. He was 61 years old. Mr. Tynan remained in a consulting and advisory capacity with the company until the time of his death.

GEORGE A. COOPER, vice-president of the Frost Railway Supply Company, Detroit, Mich., died on June 1. He was 66 years of age and had been associated with the Frost Railway Supply Company for 28 of the 40 years which he spent in the railway supply business. Mr. Cooper was formerly for a number of years a member of the executive committee of the Railway Supply Manufacturers' Association.

ALFRED NATHAN, president of the Nathan Manufacturing Company, New York, and an officer in several other industrial companies, died on May 22, at the Columbia Medical Centre, New York, after a short illness. Mr. Nathan was born on November 21, 1866, at New York. He was graduated from Stevens Institute of Technology, in 1890 as a mechanical engineer and succeeded his father, Max Nathan, as president of the Nathan Company in 1908. Mr. Nathan was a member of a number of societies and clubs including the American Society of Mechanical Engineers.

JOSEPH W. BETTENDORF, president of the Bettendorf Company, Bettendorf, Iowa, who died at Davenport on May 17 of heart failure, was born at Leavenworth, Kan., on October 10, 1864, and entered business as a machinist and foreman for the Peru Plow Company. In 1886 he joined his brother, who was establishing a factory for the manufacture of metal wheels and became general superintendent of the business. In 1895 the business was incorporated as the Bettendorf Axle Company and he was made vice-president, secretary and general manager. The business was soon expanded to include the railway field, the company making car parts, brake beams and bolsters. Upon the death of his brother in 1910, J. W. Bettendorf succeeded him as president and treasurer. Since 1906 the company has been making freight cars. At the time of his death, Mr. Bettendorf was also president of the Bettendorf Water Company, the Bettendorf Light & Power Company, the Micro Machine Company, the Zimmerman Steel Company and the Westco-Chippewa Pump Company.

SPENCER OTIS, president of the National Boiler Washing Company, Chicago, died in Waco, Tex., on June 10. Mr. Otis was born at Orange, N. J., on February 28, 1858. He entered railway service with the Union Pacific in 1879 as an apprentice, and, until 1890, held the positions of foreman, master mechanic and divisional mechanical

Spencer Otis

engineer. In 1890 he left railway work to take charge of the Kansas City Switch & Frog Company and later joined another railway supply company to engage in the development of the drop-bottom coal car. In 1920 he was elected president of the National Boiler Washing Company.

FRANK H. WHITNEY, representative of the Westinghouse Air Brake Company and the Westinghouse Traction Brake Company, at Boston, Mass., died on June 8 at his home in Needham, Mass. Mr. Whitney was born on March 4, 1868, at Bridgeport, Conn., and attended public schools of Boston. He began railroad work at an early age on the Boston & Providence, later a part of the Old Colony System (now the New York, New Haven & Hartford). After serving as locomotive fireman he was engineman on the "Bay State Limited." Mr. Whitney was promoted to the position of air brake instructor at the time the Westinghouse Air Brake Company's instruction car was traversing the Old Colony line, and he subsequently became road foreman of engines. In 1904, he entered the service of the Westinghouse Air Brake Company as a traveling air brake inspector at Boston and in 1907 was transferred as inspector to the New York office. He subsequently was appointed representative at New York. In January, 1923, he was promoted to export representative at New York and since January, 1932, had served as representative in charge of its Boston, Mass., office.

Personal Mention

General

D. R. SWENEY, road foreman of engines of the Chicago, Burlington & Quincy, at Chicago, has been appointed chief smoke inspector with the same headquarters.

BELOIT N. LEWIS, mechanical superintendent of the Soo Line, with headquarters at Minneapolis, has been placed in charge of the locomotive and car departments of the Minneapolis, St. Paul & Sault Ste. Marie and the Duluth, South Shore & Atlantic, to succeed Theodore A. Foque.

HERBERT M. CARSON, general superintendent of the Central Pennsylvania division of the Pennsylvania, with headquarters at Williamsport, Pa., retired on July 1. Mr. Carson was born at Baltimore, Md., on March 13, 1867, and received his education at Lehigh University (M.E. 1889). He entered railroad service in 1889 as special apprentice at the Altoona shops of the Pennsylvania, and has since been continuously in the employ of that road. In 1892 he was appointed inspector of the West Philadelphia shop and the following year became assistant road foreman of locomotives. In 1895 he was appointed assistant engineer of motive power at Altoona, and in 1900 became master mechanic. The following year he was appointed assistant to general manager, with headquarters at Philadelphia, Pa., and since 1909 has served as general superintendent.

C. E. ALLEN, assistant to the mechanical superintendent of the Northern Pacific, with headquarters at St. Paul, Minn., has retired after more than 52 years of continuous service with this company. Mr. Allen was born on June 29, 1863, at Paw Paw, Mich., and entered the service of the Northern Pacific as a locomotive fireman of the Missouri division on May 1, 1881. Three years later he became a hostler and switch engineman on the Missouri division, and on January 1, 1887, was promoted to road engineman of the same division, being appointed road foreman of engines of the Montana and Yellowstone divisions on September 1, 1901. On September 1, 1903, he was promoted to the position of master mechanic of the Yellowstone division and on April 1, 1908, was transferred to the Montana division. On January 15, 1910, Mr. Allen was appointed general master mechanic of the Yellowstone, Montana and Rocky Mountain divisions, and on May 1, 1919, became general master mechanic of the lines east of Mandan, N. D. He was appointed assistant to the mechanical superintendent on September 1, 1930.

THEODORE A. FOQUE, general mechanical superintendent of the Minneapolis, St. Paul & Sault Ste. Marie and of the Duluth, South Shore & Atlantic, with headquarters at Minneapolis, Minn., at his own request retired from active service on July 1. Mr. Foque was born on January 14, 1866, at Boston, Mass., and received his

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BUY A GEAR THAT SERVICE HAS PROVED

The Power Reverse Gear with Trunk Type Piston *Eliminating Crosshead and Guides*

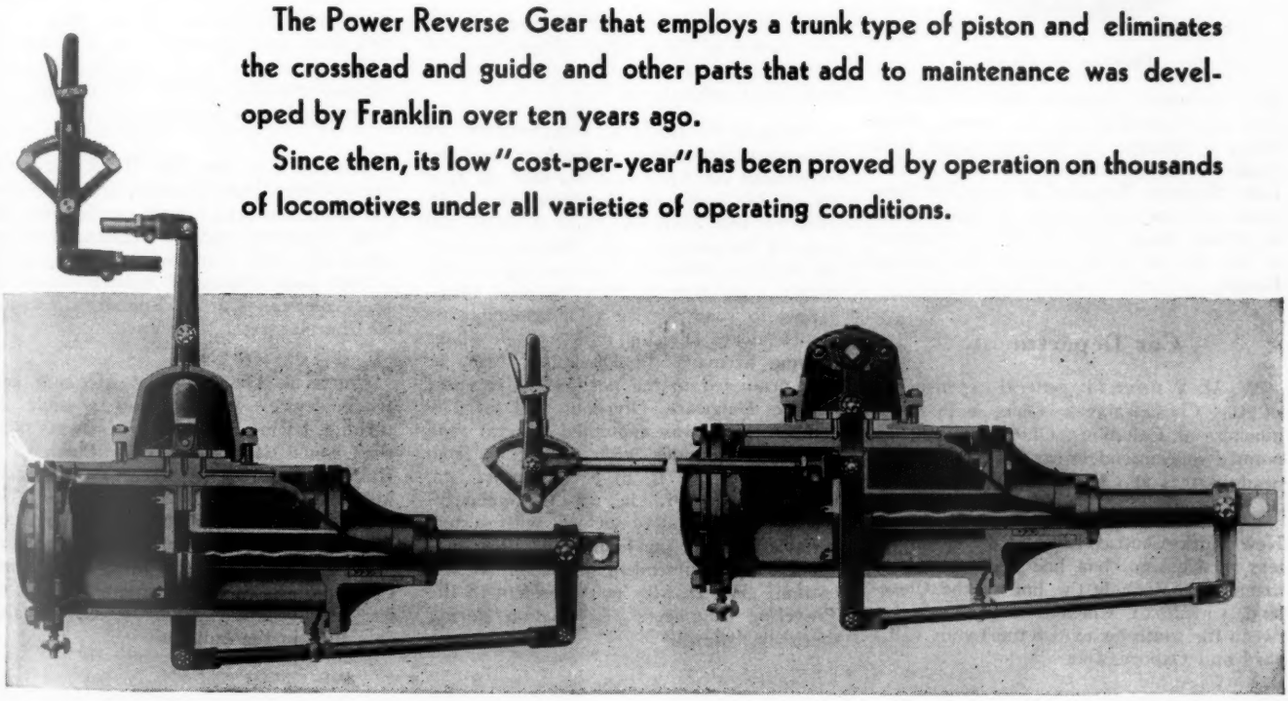
— Developed by Franklin

— For Ten Years Made by Franklin

— Proved on Thousands of Locomotives

The Power Reverse Gear that employs a trunk type of piston and eliminates the crosshead and guide and other parts that add to maintenance was developed by Franklin over ten years ago.

Since then, its low "cost-per-year" has been proved by operation on thousands of locomotives under all varieties of operating conditions.



FRANKLIN IS PREPARED TO FURNISH THE TYPE OF GEAR BEST SUITED TO EACH APPLICATION

HERE ARE THE DESIGN FEATURES

A balanced slide valve is used. Every air man is familiar with this type and understands the little maintenance required.

Crossheads and guides are eliminated, thus reducing weight, number of parts for stock and over-all dimensions.

The piston trunk and front head are proportioned to care for all side and vertical stresses at low unit bearing pressures. The self-adjusting piston rod packing requires no attention between shoppings.

The seal between the Rocker Arm and the Valve Chest is accomplished by a metallic joint. This is an advantage over soft packing.

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FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO MONTREAL

technical education at Massachusetts Institute of Technology. He entered railway service in 1888 as chief draftsman and engineer of tests of the Soo Line. In 1894 he was promoted to the position of assistant mechanical superintendent and in 1901 was made mechanical superintendent, being appointed general mechanical superintendent in 1909. During federal control of the railroads, Mr. Foque's jurisdiction as general mechanical superintendent of the Soo Line was extended over the Duluth, South Shore & Atlantic, the Mineral Range Railroad, the Copper Range Railroad and the Lake Superior Terminal & Transfer Company, and upon the return of the railroads to private control, he retained jurisdiction of the D. S. S. & A. and the Mineral Range.

Theodore A. Foque

Car Department

W. M. WHEATLEY, general car inspector of the Chesapeake & Ohio, with headquarters at Columbus, Ohio, has been appointed superintendent car department with headquarters at Cleveland, Ohio.

E. M. WILCOX, master car builder on the New York Central Lines, with headquarters at Chicago, has had his jurisdiction extended to include the line of the Cleveland, Cincinnati, Chicago & St. Louis between the south switch of the Lyons (Ill.) yard and Osborn, Ind.

Master Mechanics and Road Foreman

M. MCCASKILL has been appointed master mechanic of the Columbus & Greenville, with headquarters at Columbus, Miss., to succeed T. M. Pullen, deceased.

H. E. LOGAN, master mechanic of the Centerville division of the Chicago, Burlington & Quincy, at Centerville, Iowa, has been appointed road foreman of engines, with headquarters at St. Joseph, Mo.

W. E. CORYA, assistant master mechanic of the Beardstown division of the Chicago, Burlington & Quincy, with headquarters at Beardstown, Ill., has been appointed master mechanic of the same division, a position he was holding at the time of his appointment as assistant master mechanic a year ago. The position of assistant master mechanic has been abolished.

C. E. MELKER, master mechanic of the Hannibal division of the Chicago, Burlington & Quincy, with headquarters at Hannibal, Mo., has had his jurisdiction extended to include the Centerville division of the C. B. & Q.

Purchasing and Stores

THOMAS R. DICKINSON has been appointed purchasing agent of the Bessemer & Lake Erie and the Union Railroad Company, with headquarters at Pittsburgh, Pa.

M. B. BOWMAN has been appointed general storekeeper of the New York, Chicago & St. Louis, with headquarters at Lima, Ohio.

H. K. T. SHERWOOD has been appointed purchasing agent of the Delaware & Hudson, with headquarters at Albany, N. Y.

Obituary

W. A. CALLISON, superintendent of motive power of the Chicago, Indianapolis & Louisville, with headquarters at Lafayette, Ind., died suddenly on July 2.

THOMAS F. HOWLEY, superintendent of locomotive operation of the Erie until his retirement on April 1, 1931, died on June 16 at his home in Dunmore, Pa. Mr. Howley was born on April 8, 1859, and entered the service of the Erie on January 18, 1874, at Hawley, Pa., as a machinist helper. In March, 1876, he was transferred to road service as a brakeman on the Delaware Division, and two years later became fireman. In December, 1884, he was promoted to the position of engineer of the Delaware Division, and in December, 1904, was appointed general road foreman of engines, with jurisdiction from Jersey City, N. J., to Susquehanna, Pa. On March 1, 1913, he was appointed inspector of locomotive service, with system jurisdiction, and on January 1, 1916, was appointed superintendent of locomotive operation. Mr. Howley was president of the Traveling Engineers' Association during the year 1923-24.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

STEEL CASTINGS FOR LOCOMOTIVES.—An attractive 20-page, illustrated booklet descriptive of Univan steel castings for locomotives has been issued by the Union Steel Casting Company, Pittsburgh, Pa.

WELDING ENDURO STAINLESS ALLOYS.—An 18-page booklet issued by the Republic Steel Corporation, Massillon, Ohio, describes and illustrates the welding of Enduro stainless alloys by the electric arc, gas, spot and projection, seam and flash processes.

THERMO-MECHANICAL AIR-CONDITIONING SYSTEMS.—The American Car & Foundry Company, 30 Church street, New York, describes and illustrates in a four-page folder the A. C. F. thermo-mechanical air-conditioning systems for summer and year-round air conditioning.

HOPPER CAR FOR DRY BULK COMMODITIES.—General specifications and dimensions for a steel covered hopper car for handling bulk shipments, such as cement, grain and other dry bulk commodities, are given in a four-page illustrated bulletin issued by the American Car & Foundry Company, 30 Church street, New York.

CENTRODE DEVICE.—The Monarch centrode device, which makes possible the turning, boring and facing of shapes other than round, is described and illustrated in Bulletin No. 166 issued by The Monarch Machine Tool Company, Sidney, Ohio. The Monarch oval chuck which, in combination with the centrode device on a standard Monarch lathe or Keller form-turning machine, permits the production of straight or irregular contour oval work, is also described in the bulletin.

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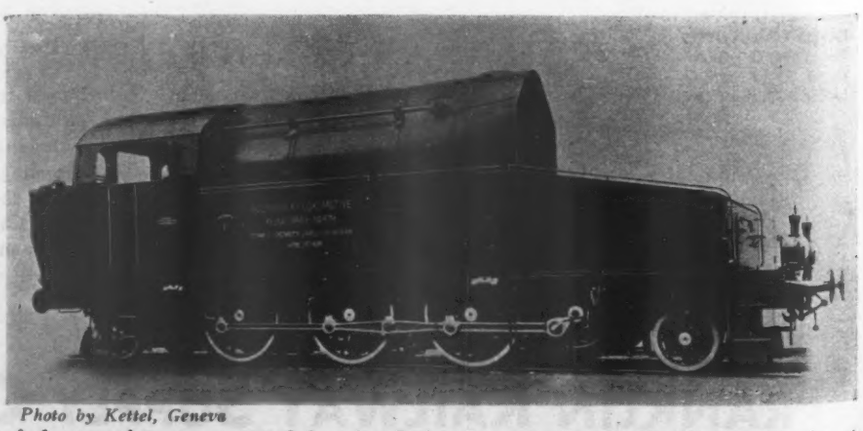

Photo by Kettel, Geneva

A locomotive constructed by the Swiss Locomotive & Machinery Works at Winterthur, Switzerland, to operate at 882 lb. boiler pressure—This locomotive has a rating of 1,000 hp.